IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

March 11, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

December 10, 2018

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF FIGURES

FIGURE **PAGE**

LIST OF TABLES

TABLE **PAGE**

ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service

PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On March 11, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007) and Westmorland (AQS Site Code 060254003), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 178 µg/m^3 and 179 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley and Westmorland were the only stations in Imperial County to measure exceedances of the PM_{10} NAAQS on March 11, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON MARCH 11, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
3/11/2016	**Brawley**	**06-025-0007**	**3**	**23**	**178**	**150**
3/11/2016	**Westmorland**	**06-025-4003**	**3**	**23**	**179**	**150**
3/11/2016	Calexico	06-025-0005	3	23	89	150
3/11/2016	El Centro	06-025-1003	4	24	47	150
3/11/2016	Niland	06-025-4004	3	23	140	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On March 11, 2016, the Brawley and Westmorland monitors were impacted by elevated particulate matter caused by the transport of fugitive windblown dust from gusty high winds caused by a vigorous Pacific cold front and an associated upper level trough that moved through the region.[2]

This report demonstrates that a naturally occurring event caused an exceedance observed on

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016, Pacific Daylight Time (PDT) is March 13 through November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

[2] Area Forecast Discussion National Weather Service San Diego CA 230 AM PST; 937 AM PST; 855 PM PST Thursday, March 10, 2016 and 907 PM PST Friday, March 11, 2016 – Phoenix AZ 230 AM MST; 227 PM MST; 810 PM MST Friday, March 11, 2016

March 11, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedance would not have occurred without the transport of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedance of 178 $\mu g/m^3$ and 179 $\mu g/m^3$ (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[3].

I.1 Demonstration Contents

Section II - Describes the March 11, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the event affected air quality. Overall, this section provides the evidence that the event was a natural event.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley and Westmorland stations this section discusses and establishes how the March 11, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the March 11, 2016 event and its resulting emissions defining the event as a “natural event”.[4]

Section IV - Provides evidence that the event of March 11, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

[3] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[4] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirements of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD and the National Weather Service (NWS) provided an extended week to weekend notification via the ICAPCD's webpage on March 5, 2016 that a cold front would pass through the region by Sunday, March 11, 2016. The San Diego and Phoenix NWS weather stories and the ICAPCD web notification advised of the possibility of strong and gusty winds through the mountains and desert regions through the weekend, with the potential for elevated particulate matter due to blowing dust. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on March 11, 2016. **Appendix A** contains copies of notices pertinent to the March 11, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. Notification occurs when an agency submits a request, which includes an initial event description, for flagging data in AQS.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley and Westmorland monitors on April 17, 2017. The INPEE, for the March 11, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days for 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County on March 11, 2016. The submitted request included a brief description of the meteorological conditions for March 11, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 10, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 178 μg/m^3 and 179 μg/m^3, which occurred on March 11, 2016 in Brawley and Westmorland. The final closing date for comments was February 12, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County continue to discuss any potential documentation of events.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the March 11, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR §50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on March 11, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event "is not reasonably controllable and not reasonably preventable."
- e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
- f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II March 11, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the March 11, 2016 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**. The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center, the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion, which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that affect Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, and the City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

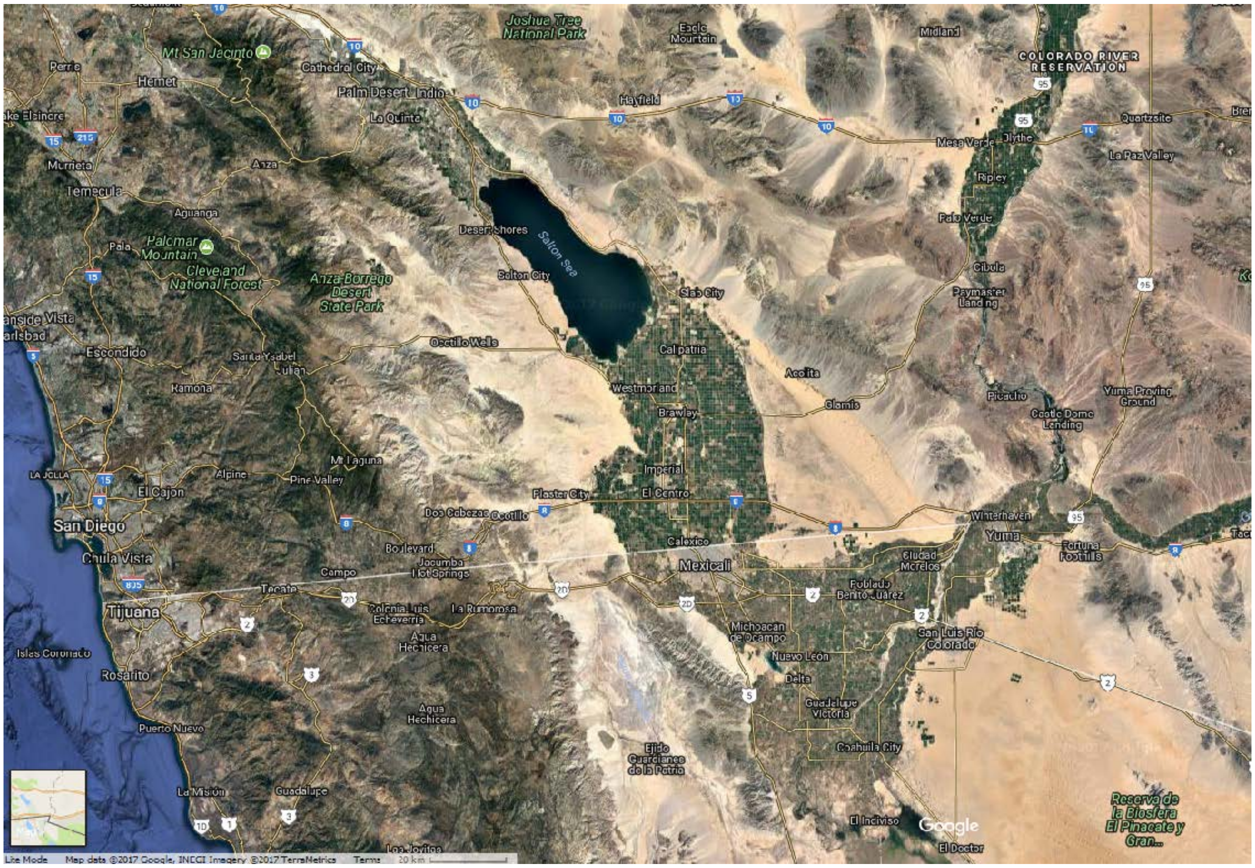


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County, four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on March 11, 2016, occurred at the Brawley and Westmorland stations. The Brawley and Westmorland stations are regarded as the "northern" monitoring sites within the Imperial County air-monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on March 11, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

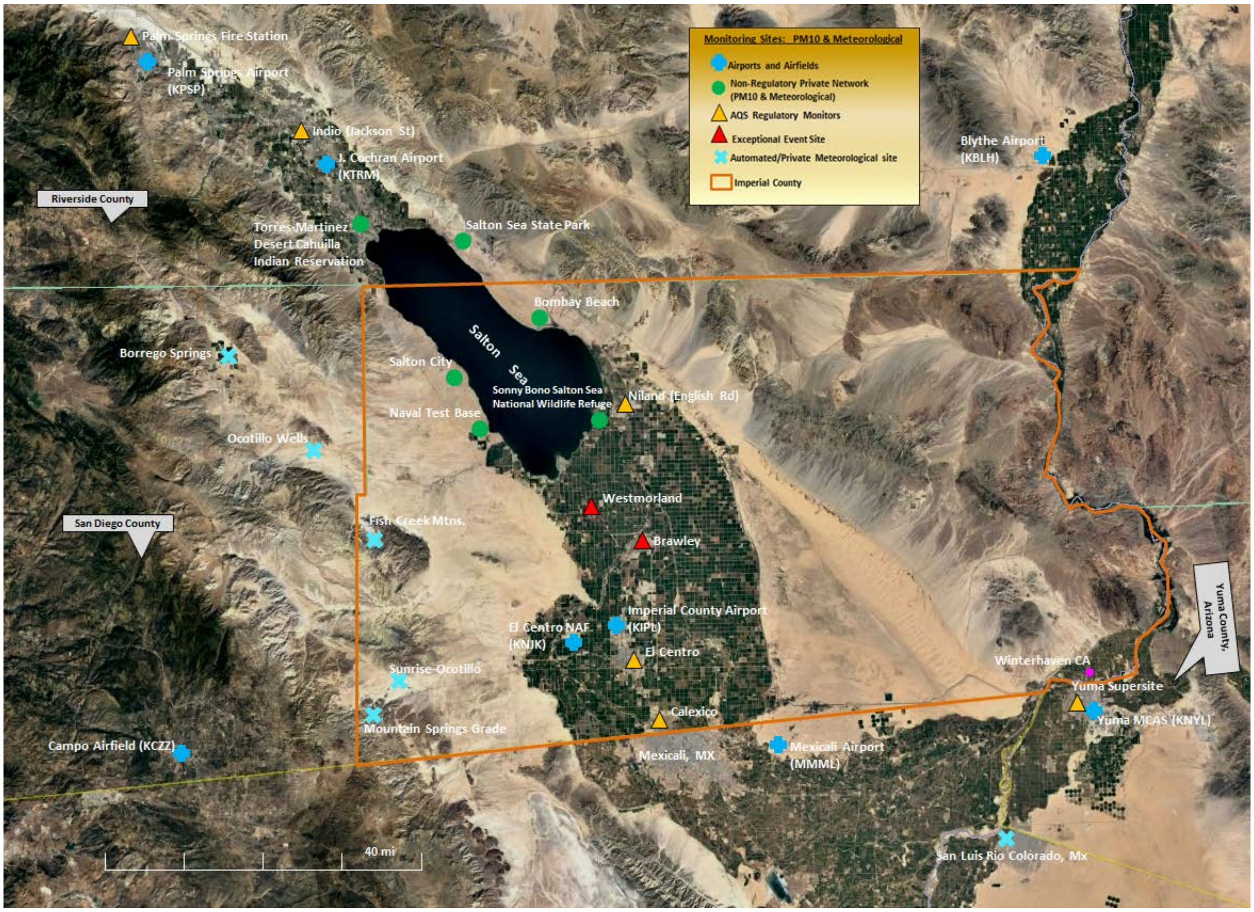


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

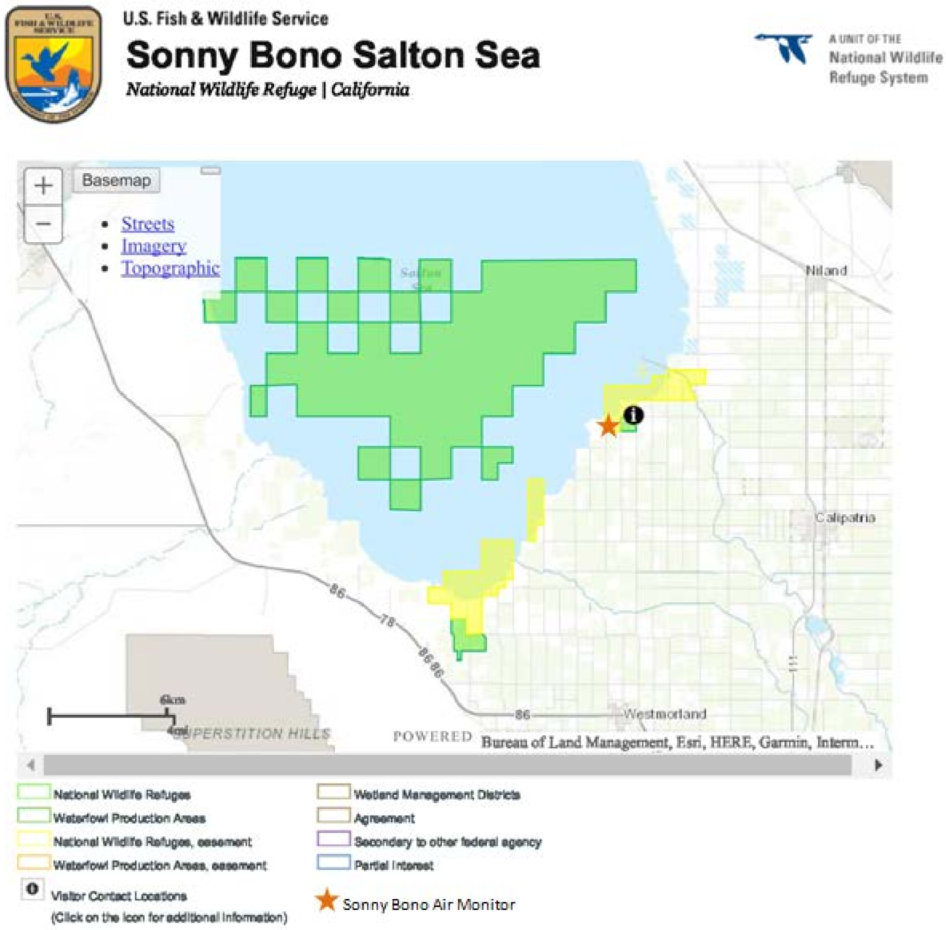


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MARCH 11, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} $(\mu g/m^3)$ Avg	1-hr PM_{10} $(\mu g/m^3)$ Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					178	786	1900		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	89	318	2100	15.5	2100
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	48	196	1300	16.8	1900
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	30.3	1900
		BAM 1020					140	995	1900		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	179	829	1900	20.6	1900
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	16	33	0700	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	43	178	1600	12	1800
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	96	842	2100	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

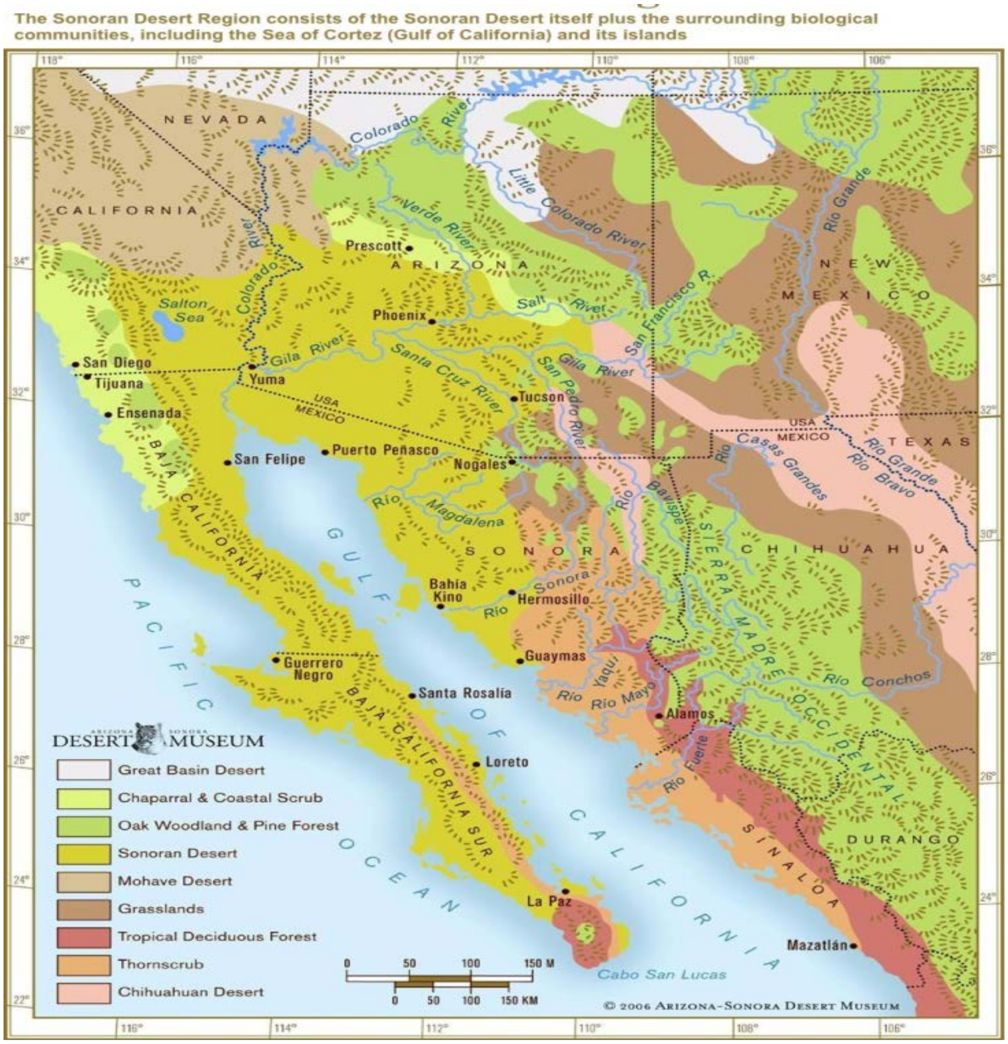


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64” (**Figure 2-16)**. During the 12-month period prior to March 11, 2016 Imperial County measured total annual precipitation of only 1.62 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

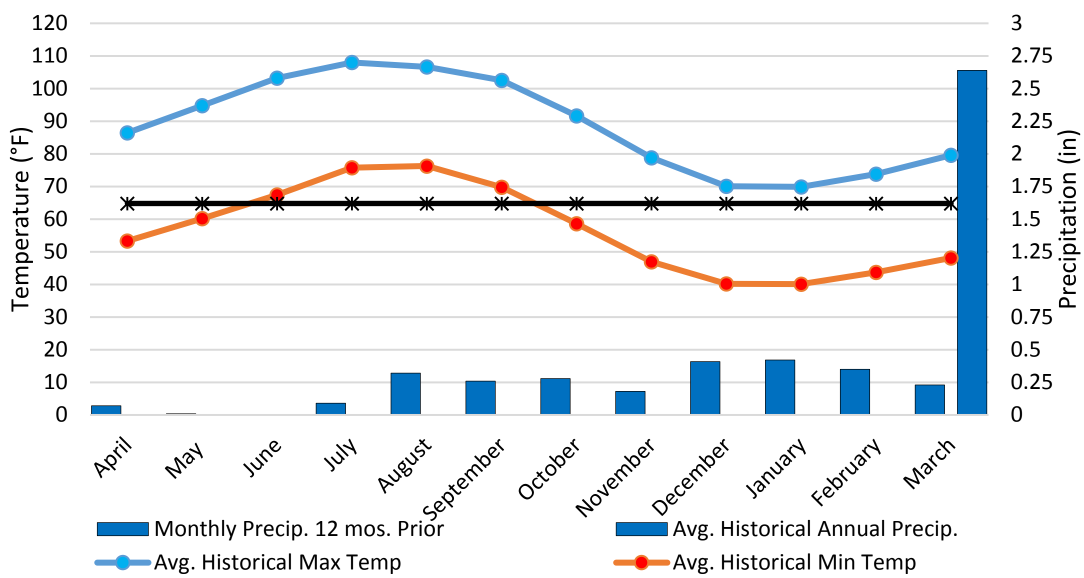


Fig 2-16: Historical Imperial County weather. Prior to March 11, 2016, the region suffered abnormally low total precipitation of 1.62 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[5] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for March 11, 2016 caused when a fast moving and vigorous Pacific cold front, associated with an upper level trough moved over the region, moved across southern California and into Imperial County. Packed pressure gradients created strong gusty westerly winds across the region. Southeastern California including Imperial County was particularly hard hit by the winds. Locally, winds reached 37 mph and gusts hit 45 mph. The strong gusty west winds transported fugitive windblown dust from areas within the San Diego County Mountains, over open natural deserts and into Imperial County, affecting air quality and causing an exceedance at the Brawley and Westmorland monitors.

According to the NWS, a cold front moved off the Southern California coast inland heading east and was over Imperial County by late evening hours on March 11, 2016.[6]

Figures 2-17 through 2-19 provide information regarding the upper level low and the associated

[5] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

[6] Area Forecast Discussion National Weather Service Phoenix AZ 810 PM MST and San Diego CA 907 PM PST Friday, March 11, 2016

cold front as it moved inland over northern California then southward over southern California. The deepening of the low caused a tightening of the pressure gradient at the surface, which led to conditions conducive to high winds across southeastern California.

FIGURE 2-17
UPPER LEVEL TROUGH DEEPENS

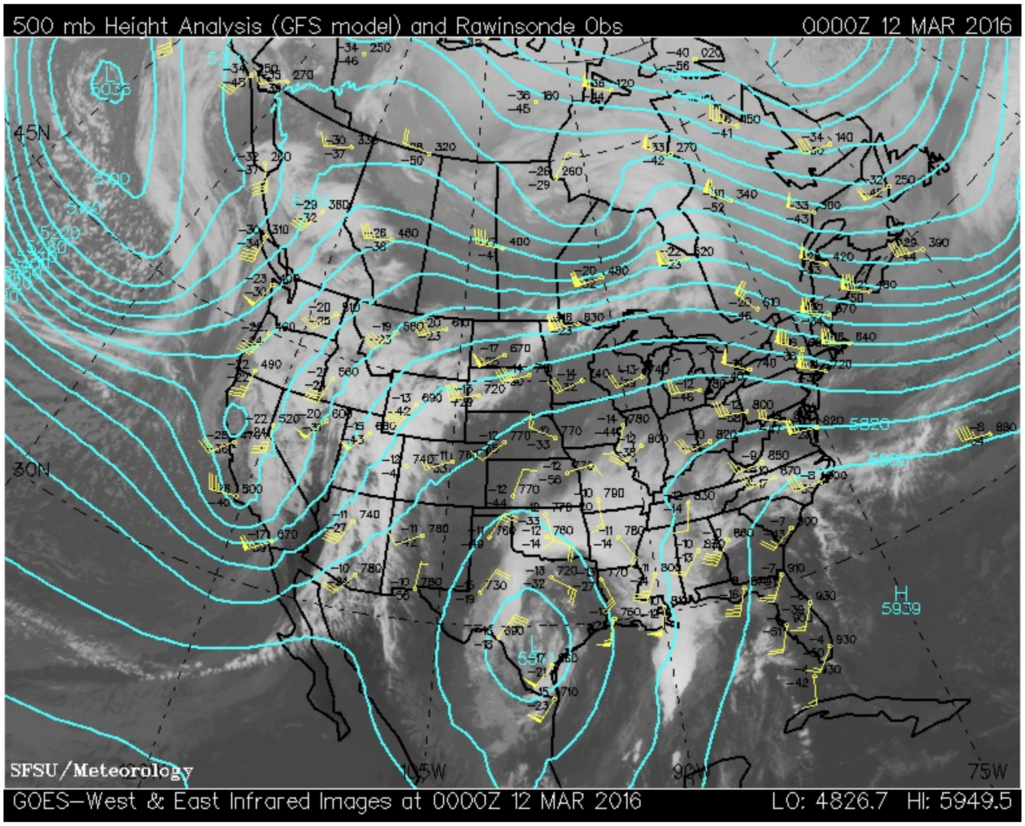


Fig 2-17: A GOES E-W infrared satellite image captured at 400pm PST March 11, 2016 at the 500mb height shows the upper level trough moving inland over northern California. The deepening of the low as it moved southward over southern California led to a tightening of pressure gradients resulting in high, gusty westerly winds across southeastern California and into southwestern Arizona coincident with measured elevated winds at local airports in Imperial County. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

FIGURE 2-18
SURFACE LOW AND COLD FRONT

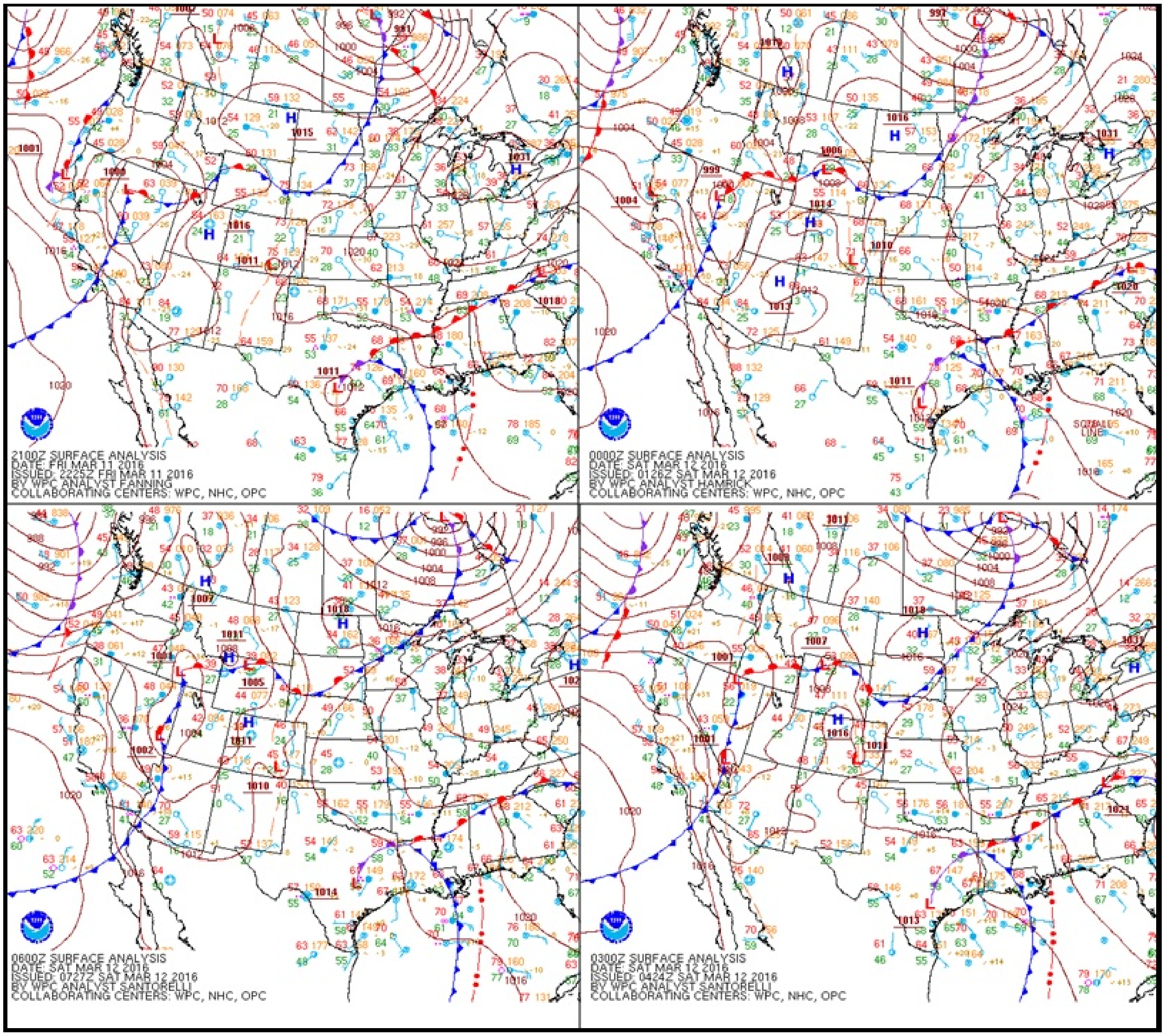


Fig 2-18: A quad of Surface Analysis images showing both the tightening of the surface gradient and the long cold front sweeping southeast across southern California. Tightening pressure gradients were associated with the front as it moved through the region. Gusty westerly winds accompanied the system as it moved across southern California. The gusty high winds were instrumental in transporting windblown dust affecting the Brawley and Westmorland monitors. Clockwise, from left: 1300 PST; 1600 PST; 1900 PST; 2200 PST, March 11, 2016. Winds across Imperial County were at their strongest during 1600 PST and 1900 PST when the gradient was at its tightest. Source: Weather Prediction Center Surface Analysis Archive.
http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

FIGURE 2-19
GOES-W SATELLITE IMAGES MARCH 11, 2016

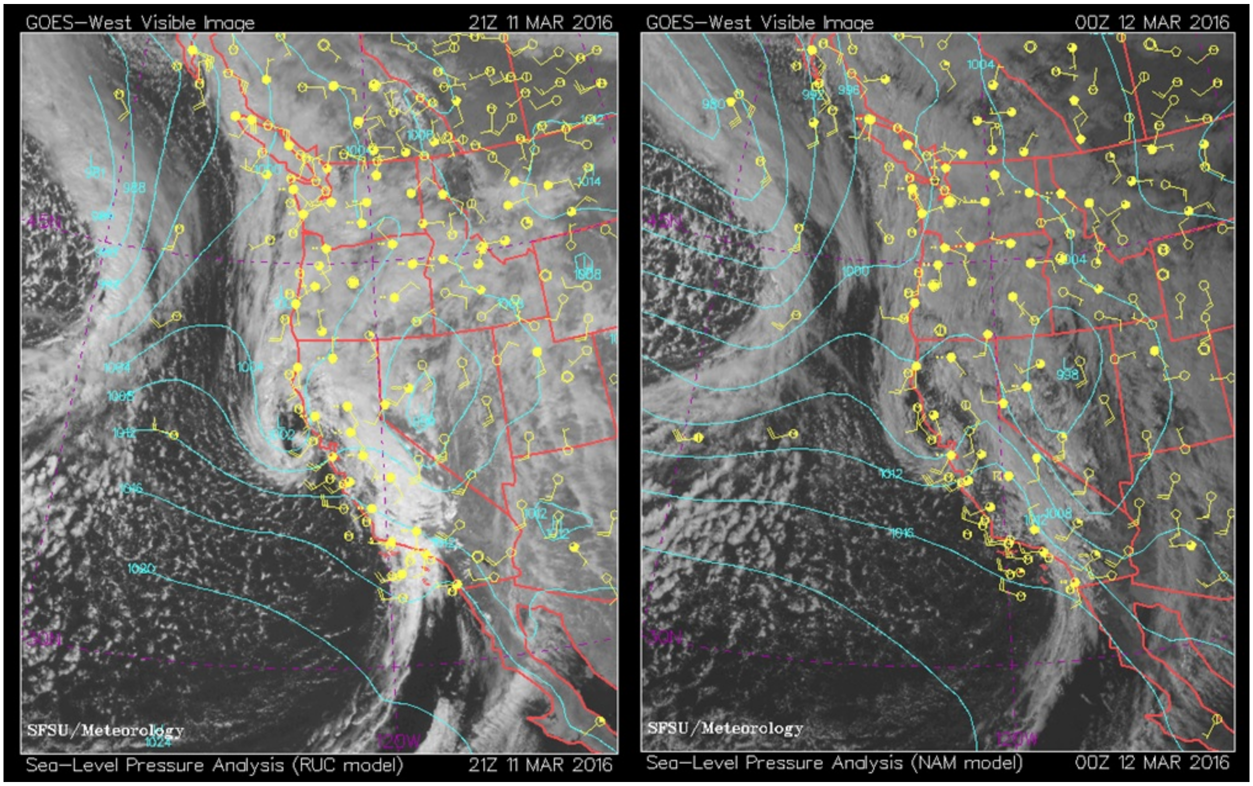


Fig 2-19: A pair of GOES-W sea-level pressure analysis images captured at 1300 (left) and 1600 PST on March 11, 2016 overlaid with wind barbs depicting general wind speed and direction. The images show westerly wind barbs of winds ranging from 12 mph to 23 mph at different locations within the region such as Blythe. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1603/

Figure 2-20 is a graphical illustration of the ramp-up analysis of the exceptional event, which affected the Brawley and Westmorland monitors. Winds from the fast-moving system began affecting Imperial County around noon. Up through midday, winds were light on March 11, 2016. By around noon winds at El Centro NAF (KNJK) and Imperial County Airport (KIPL) increased. KNJK measured six hours of winds above the 25 mph threshold, while KIPL measured four hours at or above the 25 mph threshold. Top winds at either airport measured 37 mph while gusts measured 45 mph. Transported windblown dust from the San Diego Mountains combined with dust from the natural open desert located within the western portion of Imperial County elevating concentrations of PM_{10} at both the Westmorland and Brawley monitors.

FIGURE 2-20
RAMP UP ANALYSIS MARCH 11, 2016

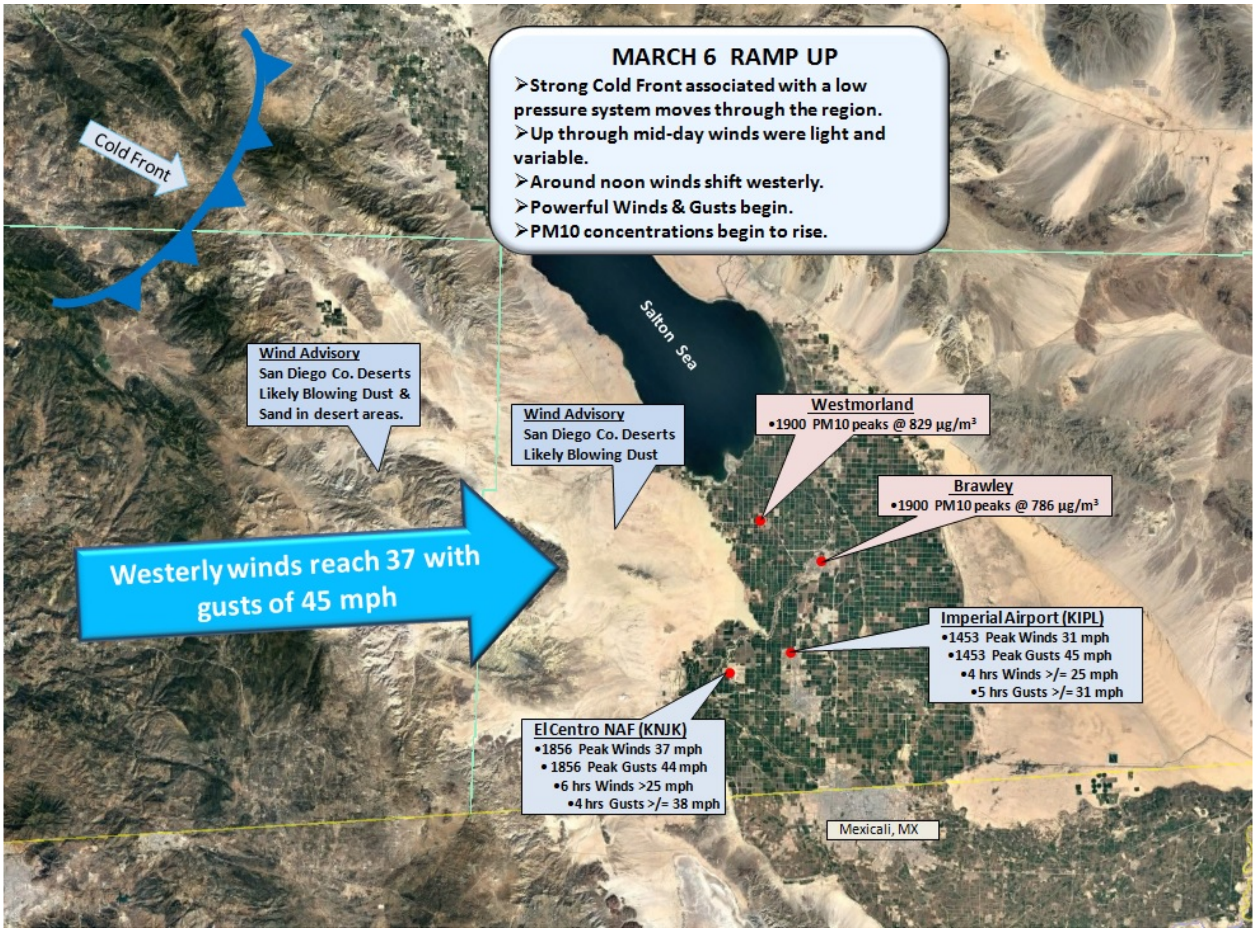


Fig 2-20: Light and variable winds up through midday turned westerly and increased steadily through the afternoon. Windblown dust transported from the mountains within San Diego County blew onto and over the open natural deserts, farmland and urban areas in Imperial County affecting air quality and causing an exceedance at the Westmorland and Brawley monitors. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON MARCH 11, 2016

Station Monitor Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed Brly	Wstmd	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	31	270	14:53	45	14:53	340	337	404
Naval Air Facility (KNJK)	37	250	18:56	44	18:56	91	541	192
Calexico (Ethel St)	19.1	274	1900	-	-	786	829	995
El Centro (9th Street)	16.8	176	1900	-	-	786	829	995
Niland (English Rd)	30.3	259	1900	-	-	786	829	995
Westmorland	20.6	289	1900	-	-	786	829	995
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	36	270	1952	46	19:52	786	829	995
Palm Springs Airport (KPSP)	26	320	1753	36	17:53	285	154	279
Jacqueline Cochran Regional Airport (KTRM) - Thermal	31	270	1759	43	17:59	285	154	279
ARIZONA - YUMA								
Yuma MCAS (KNYL)	28	280	2026	40	20:26	131	50	69
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	38	260	2040	-	-	131	50	69

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[7] depicted in **Figure 2-21**, indicates the general path of airflow as it approached Brawley (blue icon) and Westmorland (red icon).

The 12-hour back-trajectory ends at Westmorland and Brawley at 1900 PST, the peak for both monitors. Windblown dust largely from natural open desert soils carried by the strong gusty west winds affected PM_{10} monitors throughout southeastern California and Arizona. Trajectories help support the typical airflow of these gusty westerly winds that blow through the mountain passes within San Diego County, onto the desert slopes, across the desert floor over agricultural and urban landscapes within Imperial County. It should be noted that modeled winds differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

[7] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-21
HYSPLIT MODEL MARCH 11, 2016

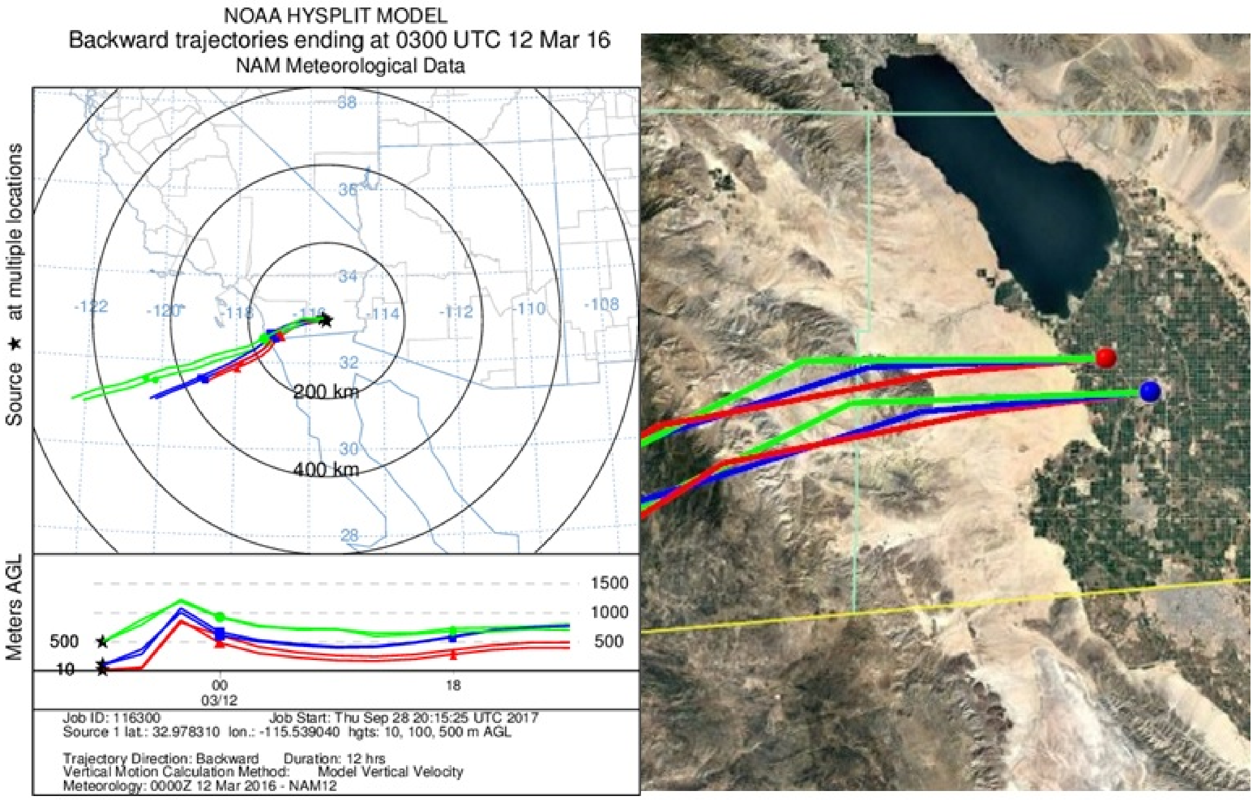


Fig 2-21: A 12-hour back trajectory ending at 1900 PST coincident with elevated hourly measured concentrations at the Brawley and Westmorland monitors. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-22 and 2-23 illustrate the winds and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties, March 10, 2016 through March 12, 2016. Windblown dust transported into Imperial County affected the Brawley and Westmorland monitors when gusty westerly winds associated with the passage of a low-pressure system and cold front blew over and through the San Diego Mountains and into Imperial County on March 11, 2016. The Brawley and Westmorland monitors measured the highest elevated concentrations at 1900 PST coincident with measured winds of 25 mph and gusts of over 30 mph at local airports.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[8] High wind dust events are considered natural events where the

[8] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the March 11, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-22
72 HOUR WIND SPEEDS REGIONAL SITES

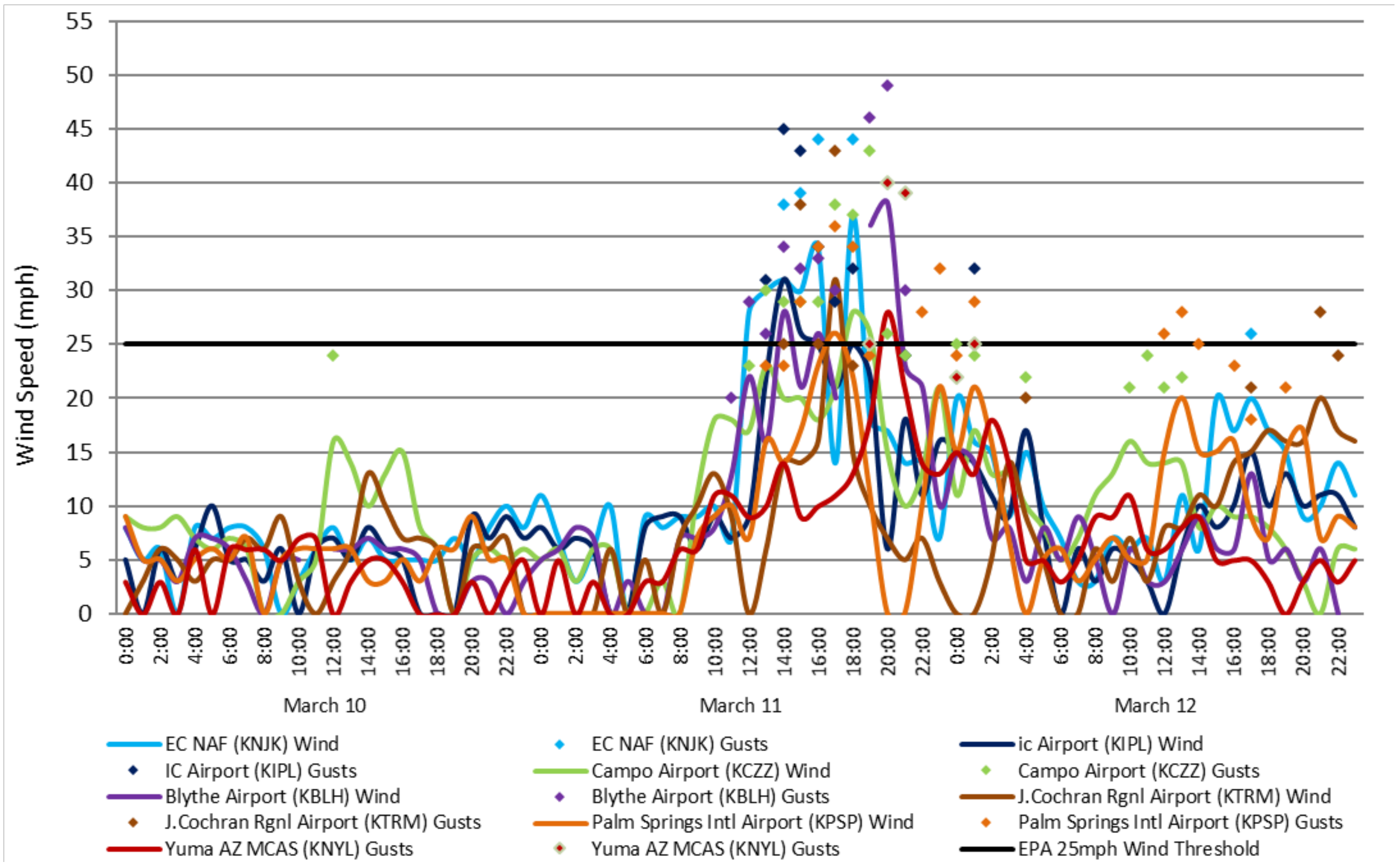


Fig 2-22: The graph illustrates the regional effect of the gusty westerly high winds. All sites measured increased wind speeds within hours of each other. The highest increases start around 1000 PST. The Imperial County Airport and the El Centro NAF measured winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system. Individual wind station graphs are located in **Appendix B**

FIGURE 2-23
72 HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

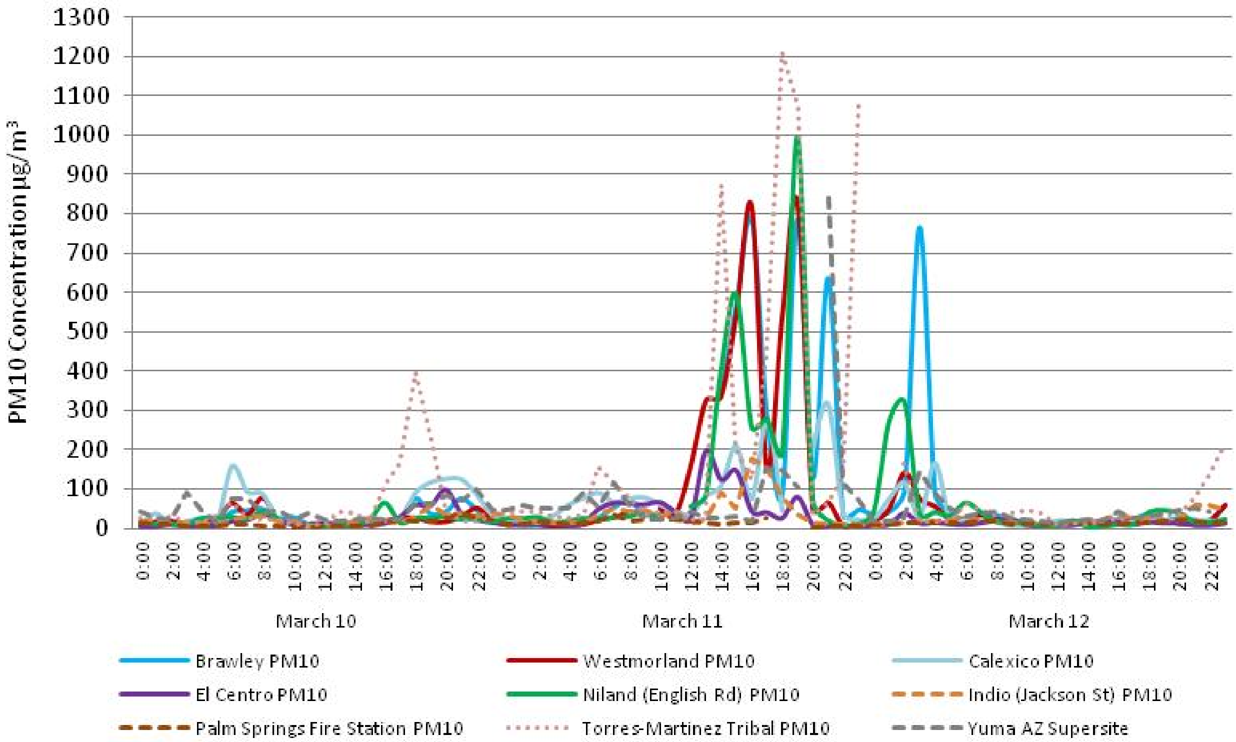


Fig 2-23: Is the graphical representation of the 72-hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at nearly all sites on March 11, 2016, demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley and Westmorland monitors on March 11, 2016, compared to non-event and event days demonstrate the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the March 11, 2016 high wind event and the exceedance measured at the Brawley and Westmorland monitors.

Figures 3-1 through 3-4 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley and Westmorland monitors for the period of January 1, 2010 through March 11, 2016. Note that prior to 2013, BAM data was not FEM therefore, not reported into AQS.[9] Properly establishing the variability of the event as it occurred on March 11, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and March 11, 2016 were compiled and plotted as a time series. All figures illustrate that the exceedance, which occurred on March 11, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[9] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 11, 2016

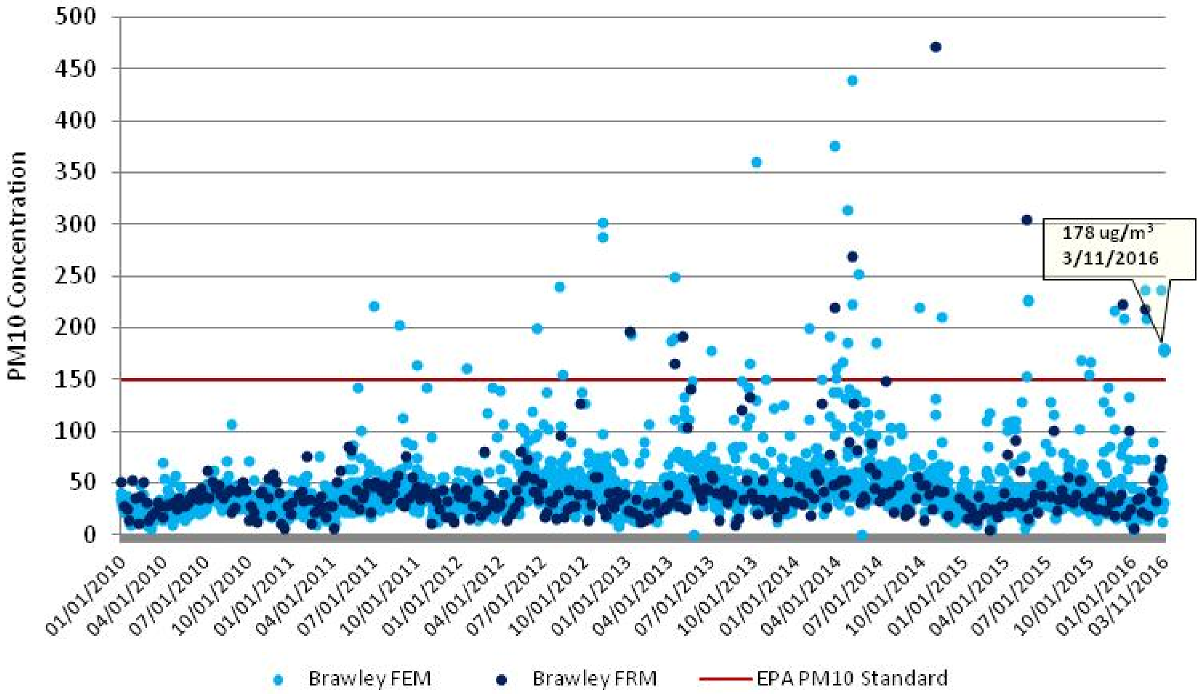


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 178 µg/m³ by the Brawley monitor was outside the normal historical concentrations when compared to event days and non-event days

FIGURE 3-2
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 11, 2016

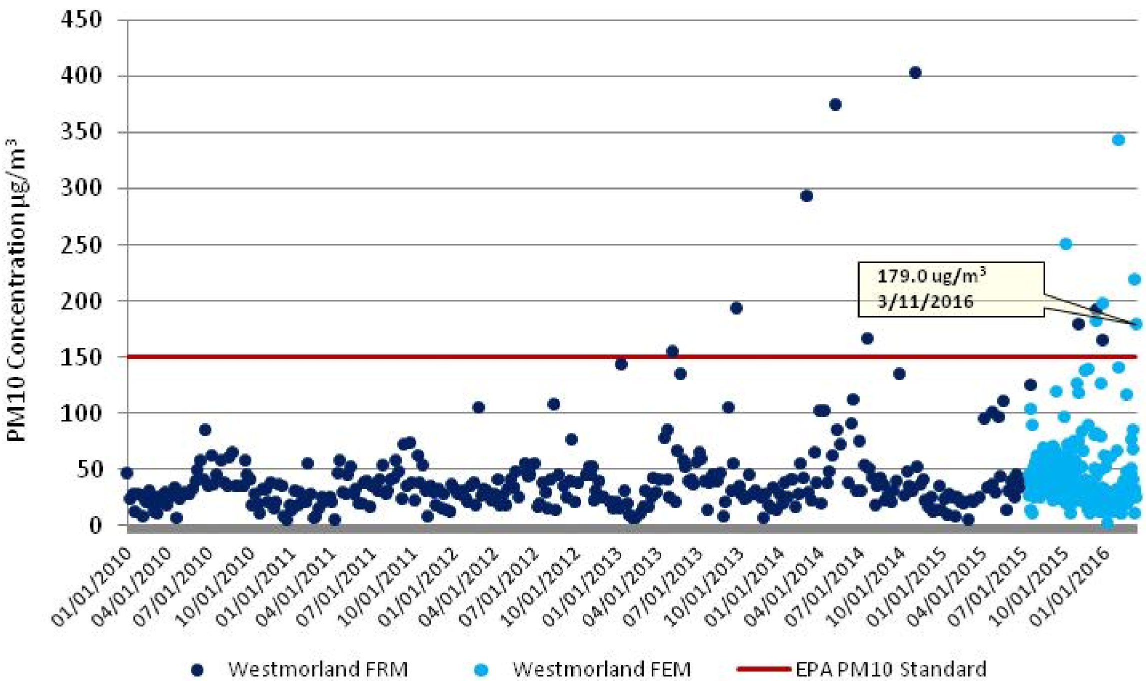
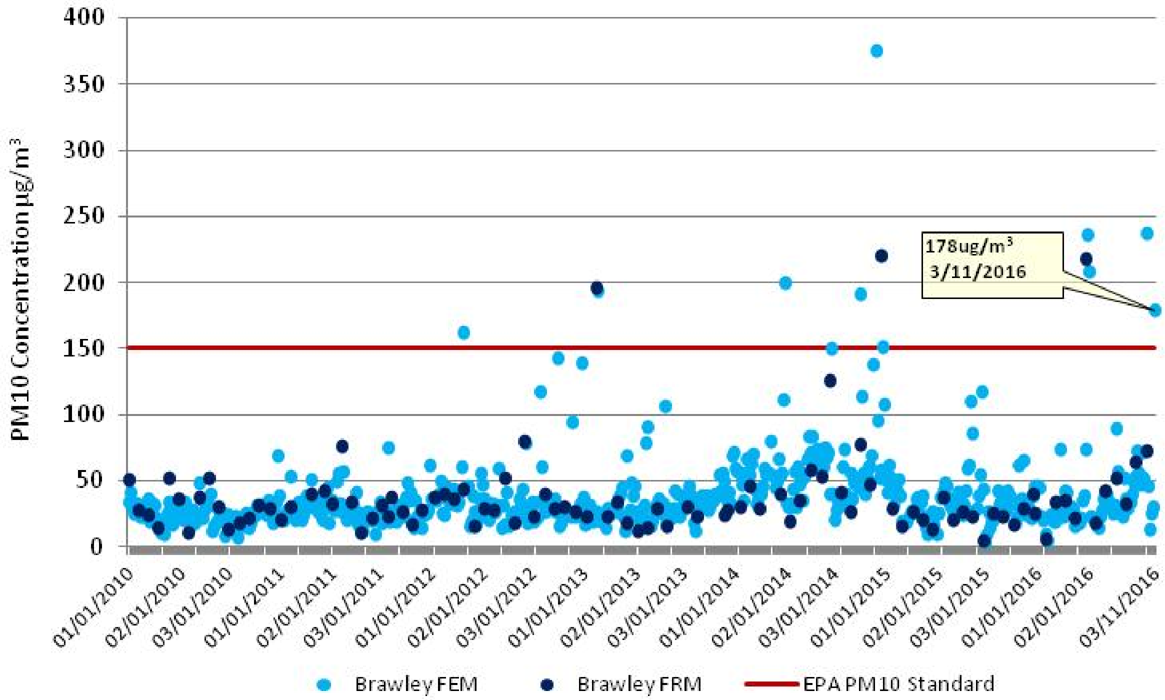


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 179 µg/m³ by the Westmorland monitor was outside the normal historical concentrations when compared to event days and non-event days

The time series, **Figures 3-1 through 3-2** for Brawley included 2,620 credible samples and for Westmorland 598 credible samples measured between January 1, 2010 and March 11, 2016 or 2,262 sampling days for Brawley and 578 sampling days for Westmorland.

Overall, the time series illustrates that the Brawley monitor, measured 42 exceedance days out of the 2,262 sampling days, which is less than a 2.0% occurrence rate. Westmorland measured 13 exceedance days out of 578 sampling days, which is less than a 2.5% occurrence rate. Of the total combined 47 exceedance days, 11 exceedance days occurred during the first quarter (January – March). The remaining 36 exceedance days occurred during the second, third and fourth quarters. The March 11, 2016 concentration is outside the normal historical measurements for the first quarter. No exceedances of the standard occurred during 2010. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

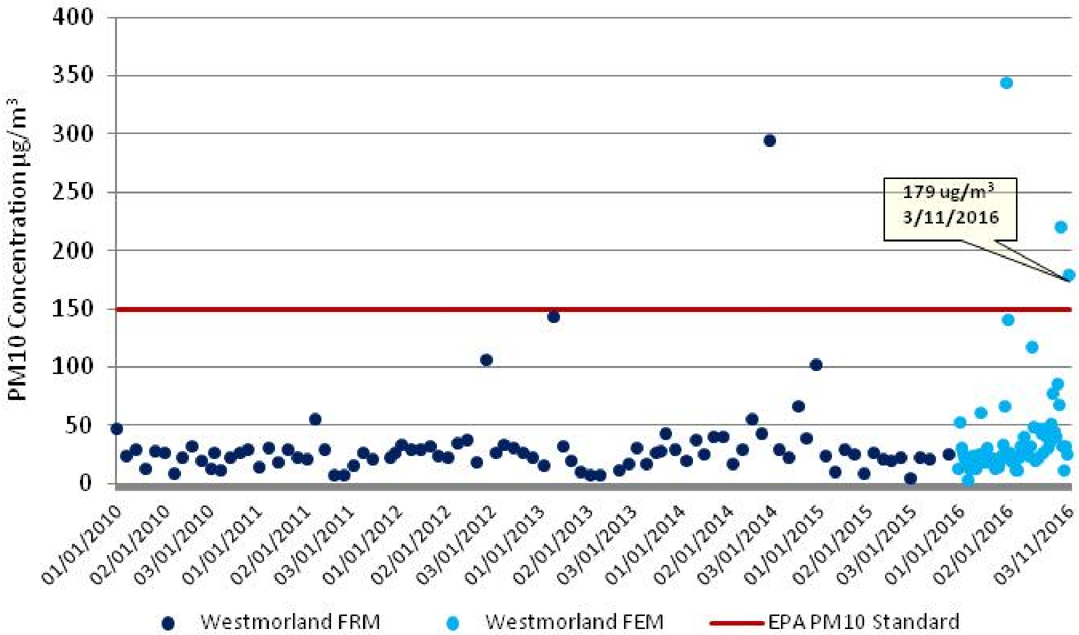
FIGURE 3-3
BRAWLEY SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***JANUARY 1, 2010 TO MARCH 30, 2016**



***Quarterly: January 1, 2010 to March 31, 2015 and March 1, 2016 to March 11, 2016**

Fig 3-3: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 178 µg/m^3 by the Brawley monitor on March 11, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

FIGURE 3-4
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***JANUARY 1, 2010 TO MARCH 30, 2016**



***Quarterly: January 1, 2010 to March 31, 2015 and March 1, 2016 to March 11, 2016**

Fig 3-4: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 179 µg/m^3 by the Westmorland monitor on March 11, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

Figures 3-3 through 3-4 displays the seasonal fluctuation over a combined quarterly review of 612 sampling days at the Brawley and Westmorland monitors for first quarter (January - March) between 2010 and 2016. Combined the Brawley and Westmorland monitors measured 871 credible samples over 612 sampling days. Of the 612 sampling days, there were 11 measured exceedance days, which equates to less than a 2.0% occurrence rate. The March 11, 2016 measured concentrations at the Brawley and Westmorland monitors were outside the normal historical and seasonal concentrations when compared to both event days and non-event days.

FIGURE 3-5
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 11, 2016

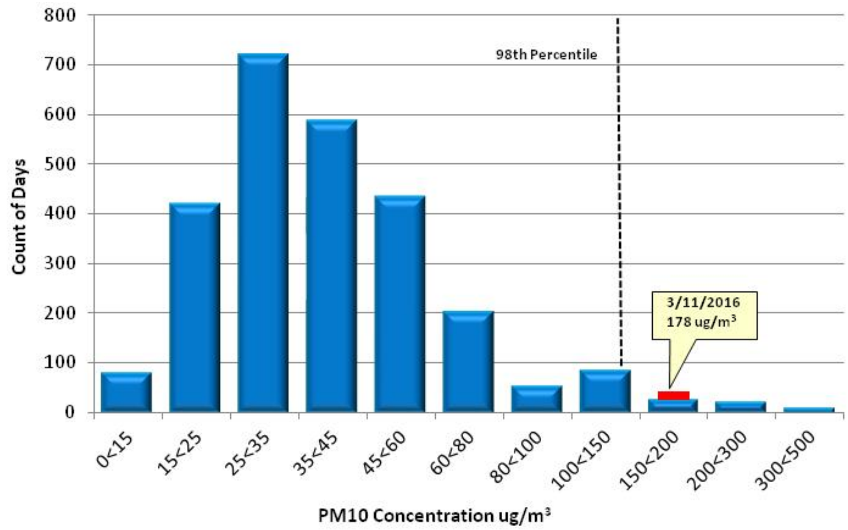


Fig 3-5: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the concentration of 178 µg/m^3 falls above the 98th percentile

FIGURE 3-6
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 11, 2016

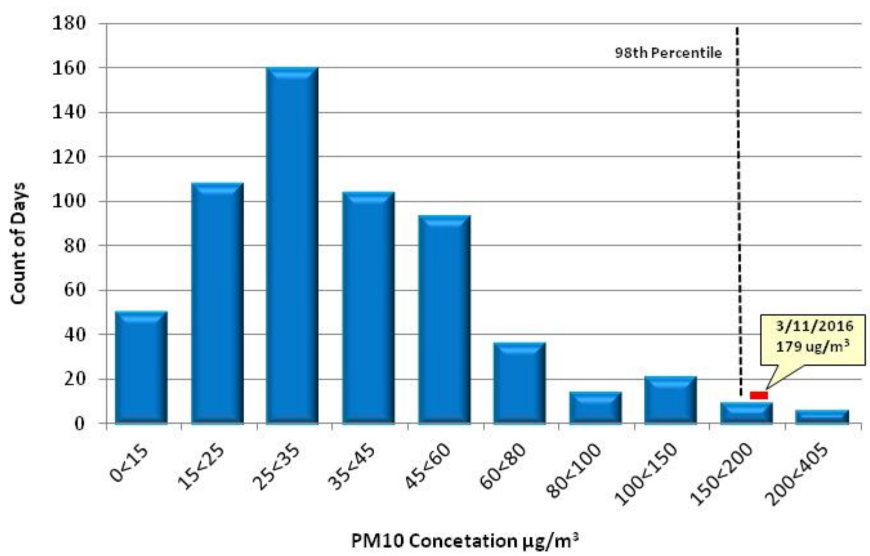


Fig 3-6: The 24-hr average PM_{10} concentration at the Westmorland monitoring site demonstrates that the concentration of 179 µg/m^3 was in excess of the 98th percentile

For the combined FRM and FEM data sets for the Brawley and Westmorland monitors the annual historical and the seasonal historical PM_{10} concentration of 178 µg/m^3 and 179 µg/m^3 both are above the 98th percentile rank. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns the March 11, 2016 measured exceedance is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on March 11, 2016 occurs infrequently. When comparing the measured PM_{10} levels on March 11, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley and Westmorland monitors were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the March 11, 2016 natural event affected the concentration levels at the Brawley and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on March 11, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. To address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures to consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for March 11, 2016. In addition, this March 11, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley and Westmorland monitors on March 11, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the March 11, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25,

1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.
On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute, which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006, ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

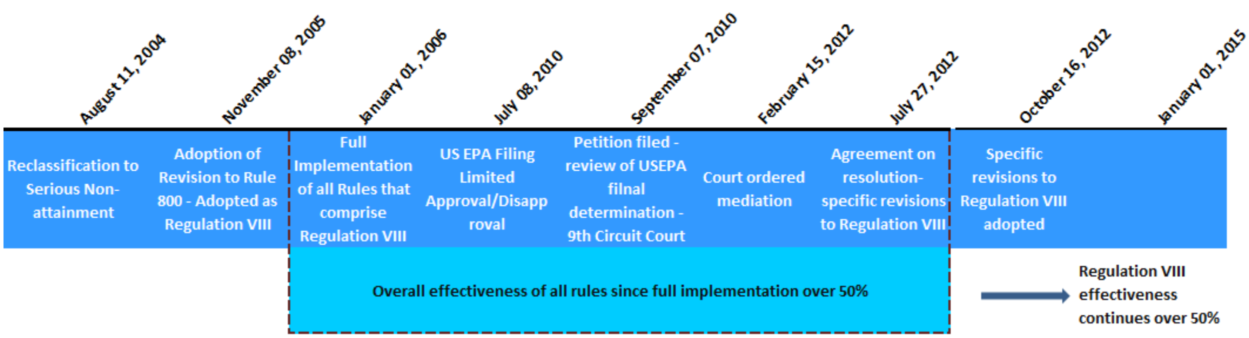


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

Below is a brief summary of Regulation VIII, which is comprised of seven fugitive dust rules. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires landowners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempt.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempt.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;

- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California, which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four-quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required, under the Good Neighbor Policy, to notice and advise members of the public of a potential burn. On March 11, 2016, declared a No Burn day, the ICAPCD did not receive any complaints regarding agricultural or waste burning.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland and Brawley during the March 11, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on March 11, 2016, officially declared a "NO" burn day, related to agricultural or waste burning. However, the ICAPCD received a dust complaint on March 11, 2016 at 1545 PST regarding earthmoving work at a Brawley Cemetery located at 4700 Hovley Road. The follow-up investigation by certified personnel, noted no visible plumes of dust and the proper application of control measures, thus no violation. In an attempt to rectify the situation, the parties agreed to move the piles of watered dirt to another location away from the fence-line abutting the residences.

FIGURE 4-2
PERMITTED SOURCES

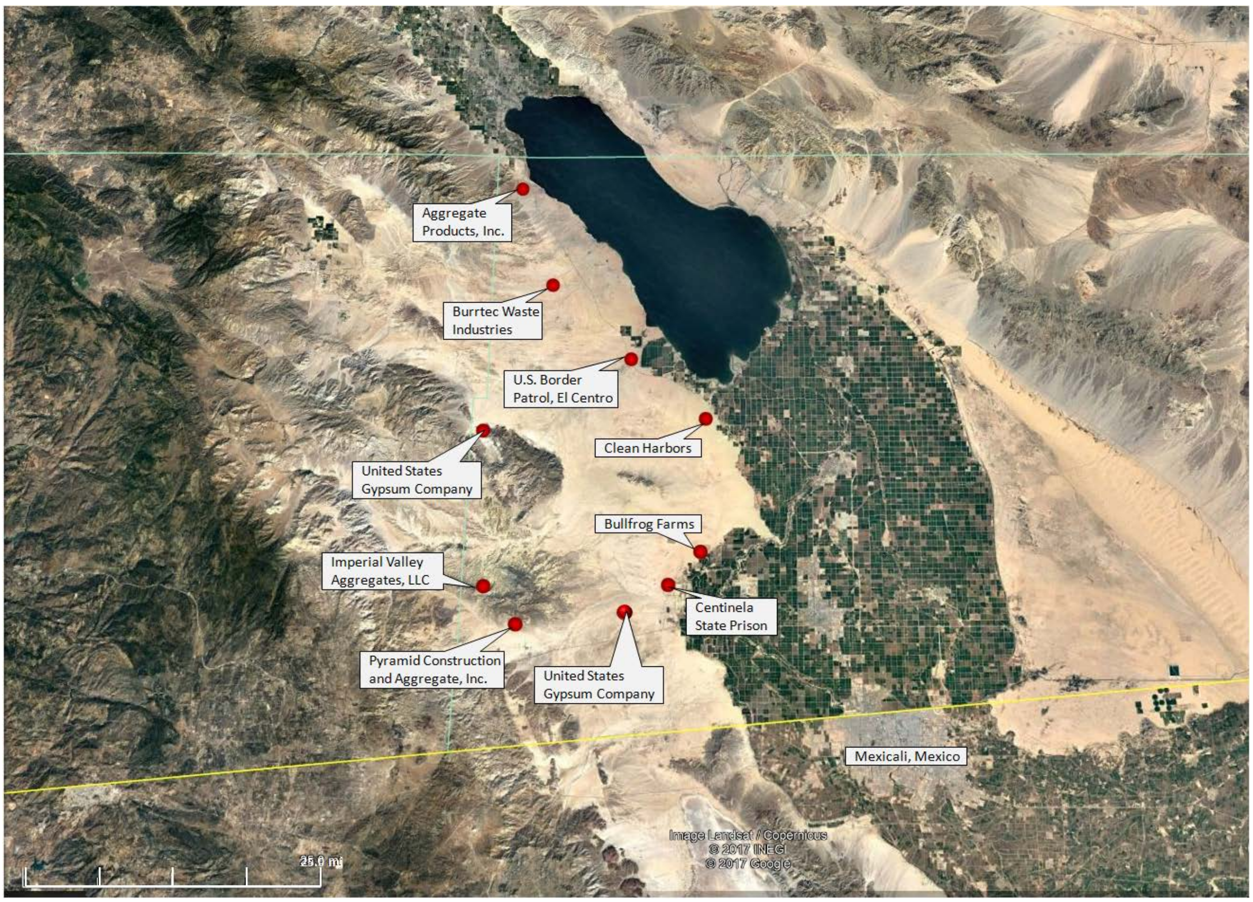


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland and Brawley monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

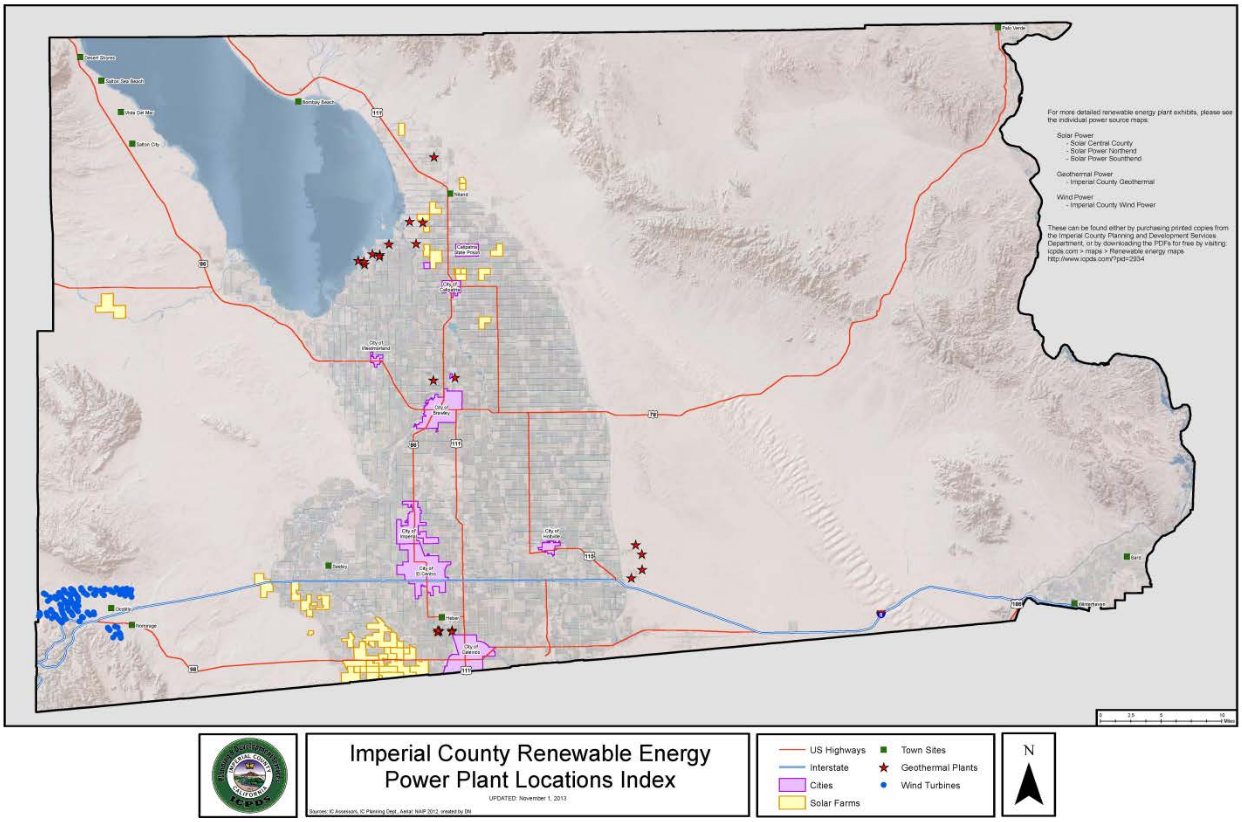


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

The NWS Phoenix office issued a Wind Advisory for Imperial County and neighboring areas in anticipation of the severity of the weather system. The advisory went into place at 1249 PST on March 10, 2016 and was effective through 2200 PST on Friday, March 11, 2016. Winds of up to 30 mph with gusts over 40 mph were forecasted. The advisory warned that high winds could lead to blowing dust. At 2001 PST on March 10, 2016, the San Diego NWS office issued a Wind Advisory that included the San Diego deserts to the west of Imperial County with forecasted winds up to 35 mph with gusts reaching 60 mph along with blowing sand and dust. Gusty westerly winds blew through and over the San Diego County Mountains over natural open deserts transporting windblown dust affecting air monitors in Imperial County.

The ICAPCD posted on its website a forecast from the NWS San Diego office regarding the high winds expected on March 10, 2016 through March 11, 2016. The notice also carried an advisory that high winds had the potential to suspend particulate matter into the air, and possibly pose an impact to public health.

IV.3 Wind Observations

Collected meteorological data from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County and from automated meteorological instruments upstream from the Brawley and Westmorland monitors was used to analyze and understand the wind event. The El Centro NAF (KNJK) measured six hours of winds at or above 25 mph. The Imperial County Airport (KIPL) measured four hours of winds above 25 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the March 11, 2016 event, wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that gusty westerly high winds accompanying a fast moving Pacific cold front transported windblown dust that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of the Brawley and Westmorland monitors during the event were high enough (at or above 25 mph, with wind gusts of 45 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be a natural event, even when portions of the wind-driven emissions are anthropogenic. However, the anthropogenic emissions must have a clear causal relationship to the event and could not be reasonably controlled or preventable. This demonstration has shown that the event that occurred on March 11, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The March 11, 2016 event can be an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for March 11, 2016 identified gusty westerly high winds associated with a fast moving and vigorous Pacific cold front that swept through southern California and portions of Arizona. As early as March 10, 2016 the NWS issued a wind advisory for Imperial County forecasting the possibility of patchy blowing dust and sand. Similarly, the NWS issued a wind advisory for parts of San Diego County that included the mountain desert slopes and desert areas. The forecast identified the possibility of reduced visibility due to blowing dust and sand below a mile. Gusty westerly winds transported windblown dust into Imperial County from areas as far as the San Diego County Mountains.

Figure 5-1 The Aqua MODIS satellite[10] captured windblown dust over Imperial County on March 11, 2016.

FIGURE 5-1
AQUA MODIS CAPTURED BLOWING DUST

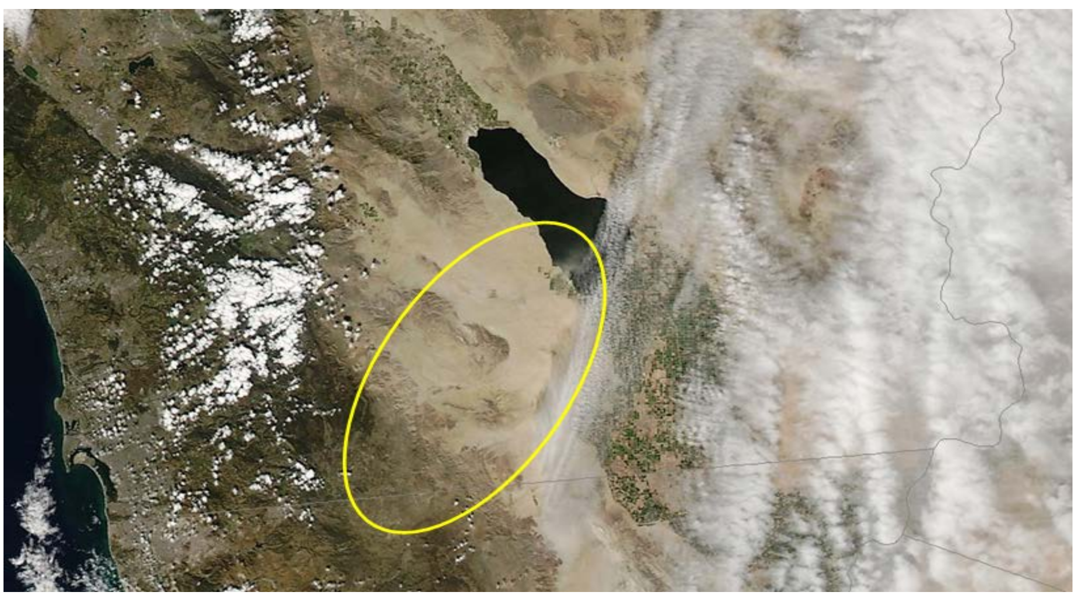


Fig 5-1: The MODIS instrument onboard the Aqua satellite captured dust blowing across the San Diego County Mountains and deserts on March 11, 2016. The image was captured ~1330 PST coincident with the elevated measured concentrations at the Brawley and Westmorland monitors. Source: MODIS Today; http://ge.ssec.wisc.edu/modis-today

[10] MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. MODIS Technical Specifications identify the Terra orbit at 1030 PST and the Aqua at 1330 PST.

Figure 5-2 is a pair of GOES-W infrared satellite images that show the tightening of the pressure gradient across southern California. The gradient was tightest between 1600 and 2200 PST on March 11, 2016. The resulting winds caused the transport of windblown dust **Figure 5-1**.

FIGURE 5-2
PRESSURE GRADIENT TIGHTENS

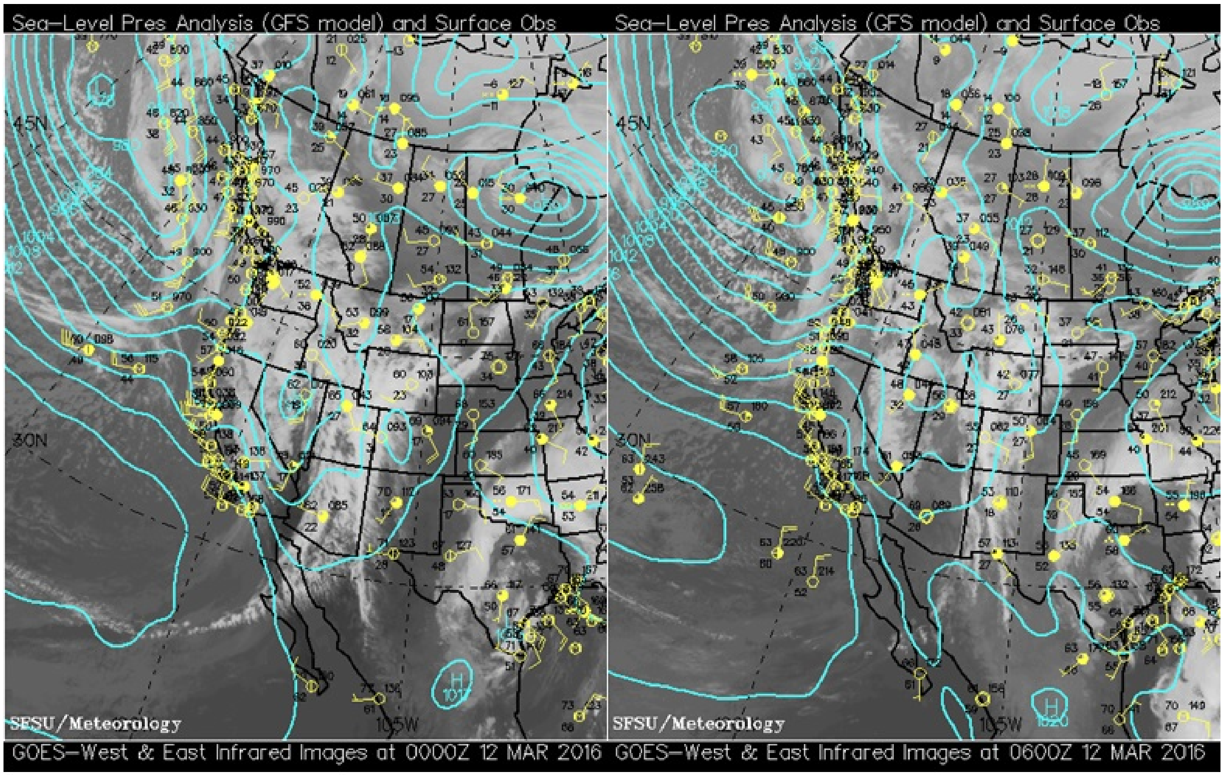


Fig 5-2: Four GOES-W infrared sea level pressure analysis images show the tightening of the pressure gradient on March 11, 2016. Left image is 1600 PST and right image is 2200 PST on March 11, 2016. Winds across Imperial County were already gusting by 1600 PST. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

Figure 5-3 is the Deep Blue Aerosol Angstrom Exponent layer over southeastern California on March 11, 2016.[11] Green colors represent the dominance of larger particles (likely dust) while blue indicates finer particles. The image captured around 1330 PST by the MODIS instrument onboard the Aqua satellite is coincident with the elevated measured concentrations at the

[11] The MODIS Deep Blue Aerosol Ångström Exponent layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) https://worldview.earthdata.nasa.gov; The Ångström Exponent (denoted as AE or α) is a measure of how the AOD changes relative to the various wavelength of light (known as 'spectral dependence'.) This is related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g. dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); https://deepblue.gsfc.nasa.gov/science

Brawley and Westmorland monitors. Unfortunately, both Terra and Aqua satellites made their pass before PM_{10} concentrations were at their highest. The El Centro NAF (KNJK) reported blowing dust at 1456 PST (**Appendix B**). Additionally, NOAA's Smoke Text Product (effective through 1800 PST) identified an area of blowing dust or sand within the vicinity of the Salton Sea (**Appendix A**).

FIGURE 5-3
DEEP BLUE AEROSOL ANGSTROM EXPONENT

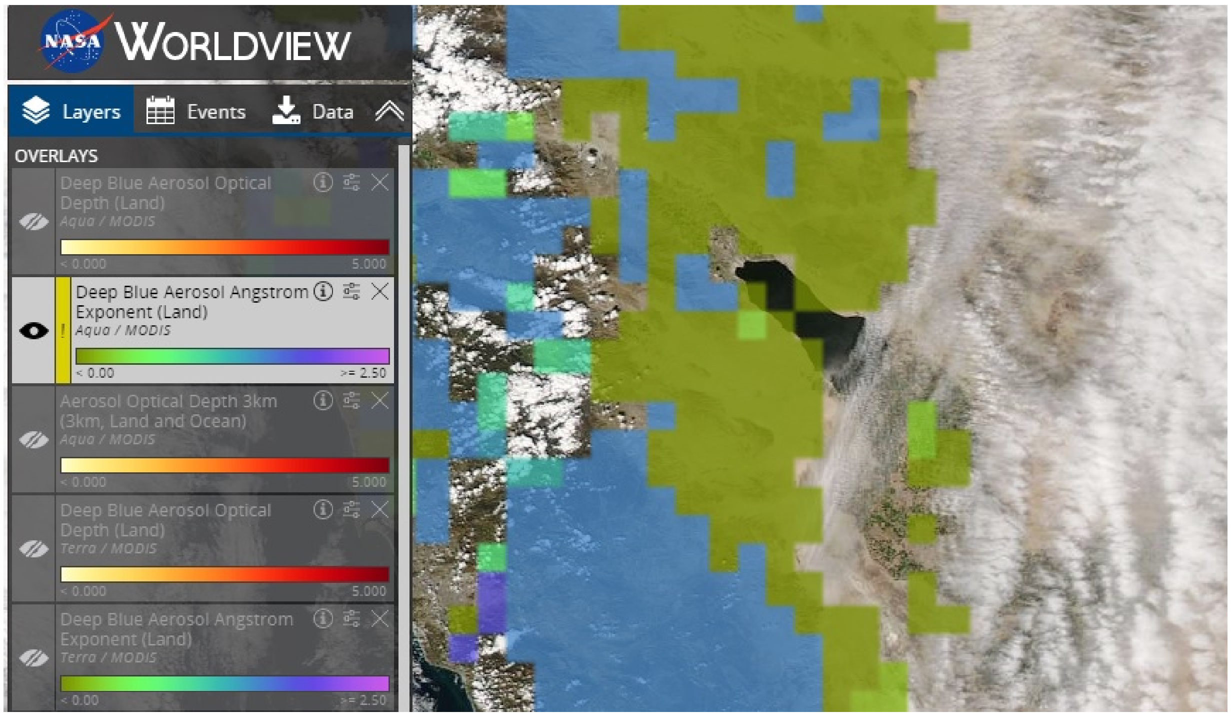


Fig 5-3: The MODIS instrument onboard the Aqua satellite captured a moderately heavy AOD over southeastern California on March 11, 2016. Green colors represent the dominance of larger particles (likely dust) while blue indicates finer particles. Although both the Terra and Aqua satellites made their pass before measured peak PM_{10} concentrations the image helps give support to the conclusion that windblown dust affect air quality in Imperial County causing an exceedance at the Brawley and Westmorland monitors. Source: https://worldview.earthdata.nasa.gov

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[12] **Tables 5-1 through 5-2** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding monitors.[13] Although the Brawley station does not measure wind speed or direction, as does Westmorland, the tables below show that the Brawley monitor measured peak hourly concentrations either following or during the period of high upstream wind speeds. As the gusty high winds blew over and through

[12] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016
[13] Not all meteorological sites measure (sample) at the same heights or with the same instruments. For additional information regarding the monitor please refer to the indicated source of the information described below each table.

the mountains of San Diego County before moving down the canyon/desert slopes and through the passes on Interstate 8 the meteorological measurements by the Mountain Springs Grade meteorological station were used to help capture the significance of the gusty high winds. As the winds blew through the mountains this helped funnel the winds toward Brawley and Westmorland.

TABLE 5-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR BRAWLEY MARCH 11, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			MOUNTAIN SPRINGS GRADE (TNSC1)			BRAWLEY
DATE	HOUR	W/S	W/D	W/G	W/S	W/D	W/G	W/S	W/D	W/G	W/S	W/D	W/G	(µg/m³)
03/11/2016	0000	11	260		8	250		10	253	17	21	208	28	15
03/11/2016	0100	7	280		6	290		7	257	13	22	209	30	11
03/11/2016	0200	3	270		7	280		9	251	15	23	206	31	10
03/11/2016	0300	6	280		6	300		13	239	18	18	203	29	9
03/11/2016	0400	10	280		0	0		8	261	14	12	218	21	15
03/11/2016	0500	0	0		0	0		5	261	9	18	215	26	20
03/11/2016	0600	9	160		8	130		8	240	12	22	206	32	30
03/11/2016	0700	8	150		9	150		10	205	14	20	209	31	56
03/11/2016	0800	9	160		9	160		11	204	15	16	204	28	75
03/11/2016	0900	9	160		6	200		10	242	17	14	210	23	37
03/11/2016	1000	10	180		9	200		15	241	21	12	230	23	39
03/11/2016	1100	7	190		7	190		13	254	25	15	201	25	42
03/11/2016	1200	28	260		9	270		14	244	27	18	227	30	32
03/11/2016	1300	30	260		22	260	31	16	226	30	17	213	32	
03/11/2016	1400	31	260	38	31	270	45	7	254	17	22	227	32	340
03/11/2016	1500	30	270	39	26	260	43	14	243	28	22	235	36	569
03/11/2016	1600	34	260	44	25	260	34	15	257	32	23	236	40	785
03/11/2016	1700	14	260		21	270	29	16	235	34	12	219	40	285
03/11/2016	1800	37	250	44	25	250	32	25	281	37	16	261	36	91
03/11/2016	1900	18	260		22	250		11	253	23	9	251	26	786
03/11/2016	2000	17	260		6	240		13	275	24	16	255	27	131
03/11/2016	2100	14	280		18	270	24	10	267	17	16	256	28	636
03/11/2016	2200	14	270		11	260		15	282	26	27	238	40	35
03/11/2016	2300	7	280		16	250		13	284	24	33	239	46	50

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Brawley station does not record wind data. Wind speeds = mph; Direction = degrees

TABLE 5-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND MARCH 11, 2016

		EL CENTRO NAF (KNJK)			IMPERIAL CO AIRPORT (KIPL)			SUNRISE-OCOTILLO (IMPSD)			WESTMORLAND			WESTMORLAND
DATE	HOUR	W/S	W/D	W/G	W/S	W/D	W/G	W/S	W/D	W/G	W/S	W/D	W/G	(µg/m³)
03/11/2016	0000	11	260		8	250		10	253	17	2.4		210	11
03/11/2016	0100	7	280		6	290		7	257	13	3.2		259	16
03/11/2016	0200	3	270		7	280		9	251	15	1.1		273	13
03/11/2016	0300	6	280		6	300		13	239	18	1.8		241	8
03/11/2016	0400	10	280		0	0		8	261	14	1.6		216	9
03/11/2016	0500	0	0		0	0		5	261	9	1.6		158	12
03/11/2016	0600	9	160		8	130		8	240	12	2.7		147	24
03/11/2016	0700	8	150		9	150		10	205	14	4.3		157	30
03/11/2016	0800	9	160		9	160		11	204	15	5.5		153	45
03/11/2016	0900	9	160		6	200		10	242	17	6.3		142	
03/11/2016	1000	10	180		9	200		15	241	21	5.6		134	53
03/11/2016	1100	7	190		7	190		13	254	25	6.7		157	37
03/11/2016	1200	28	260		9	270		14	244	27	8		217	159
03/11/2016	1300	30	260		22	260	31	16	226	30	12.3		237	327
03/11/2016	1400	31	260	38	31	270	45	7	254	17	14.5		233	337
03/11/2016	1500	30	270	39	26	260	43	14	243	28	13.2		222	549
03/11/2016	1600	34	260	44	25	260	34	15	257	32	16.9		235	820
03/11/2016	1700	14	260		21	270	29	16	235	34	12.3		235	154
03/11/2016	1800	37	250	44	25	250	32	25	281	37	14		236	541
03/11/2016	1900	18	260		22	250		11	253	23	20.6		289	829
03/11/2016	2000	17	260		6	240		13	275	24	13.5		280	50
03/11/2016	2100	14	280		18	270	24	10	267	17	15.4		275	68
03/11/2016	2200	14	270		11	260		15	282	26	9.4		269	8
03/11/2016	2300	7	280		16	250		13	284	24	11.9		273	19

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Westmorland does not record gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

Figure 5-4 graphically depicts the timeline associated with the exceedance at the Brawley and Westmorland monitors. Gusty high winds blowing across the San Diego County Mountains transported windblown dust into the natural open deserts, over agricultural land within Imperial County. It was not just the velocity of the winds, but the duration as well which played a critical role in the exceedance of the Brawley and Westmorland monitors. As the winds funneled through the San Diego Mountains, stations such as the Mountain Springs Grade (MesoWest Station ID TNSC1) measured gusty winds at or above 30 mph for 13 hours. Locally, both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) measured multiple consecutive hours of winds at or above the 25 mph threshold. By 1400 PST, both the Westmorland and Brawley monitors were measuring elevated PM_{10} concentrations above 100 µg/m³. Both monitors measured 24-hour hourly maximum concentrations at 1900 PST. In summary, strong winds blew through the San Diego County Mountains funneled down desert slopes and swept across the desert floor. Transported windblown dust from the western edge of the Sonoran Desert blew into the Imperial County affecting air quality and causing an exceedance.

FIGURE 5-4
EXCEEDANCE TIMELINE

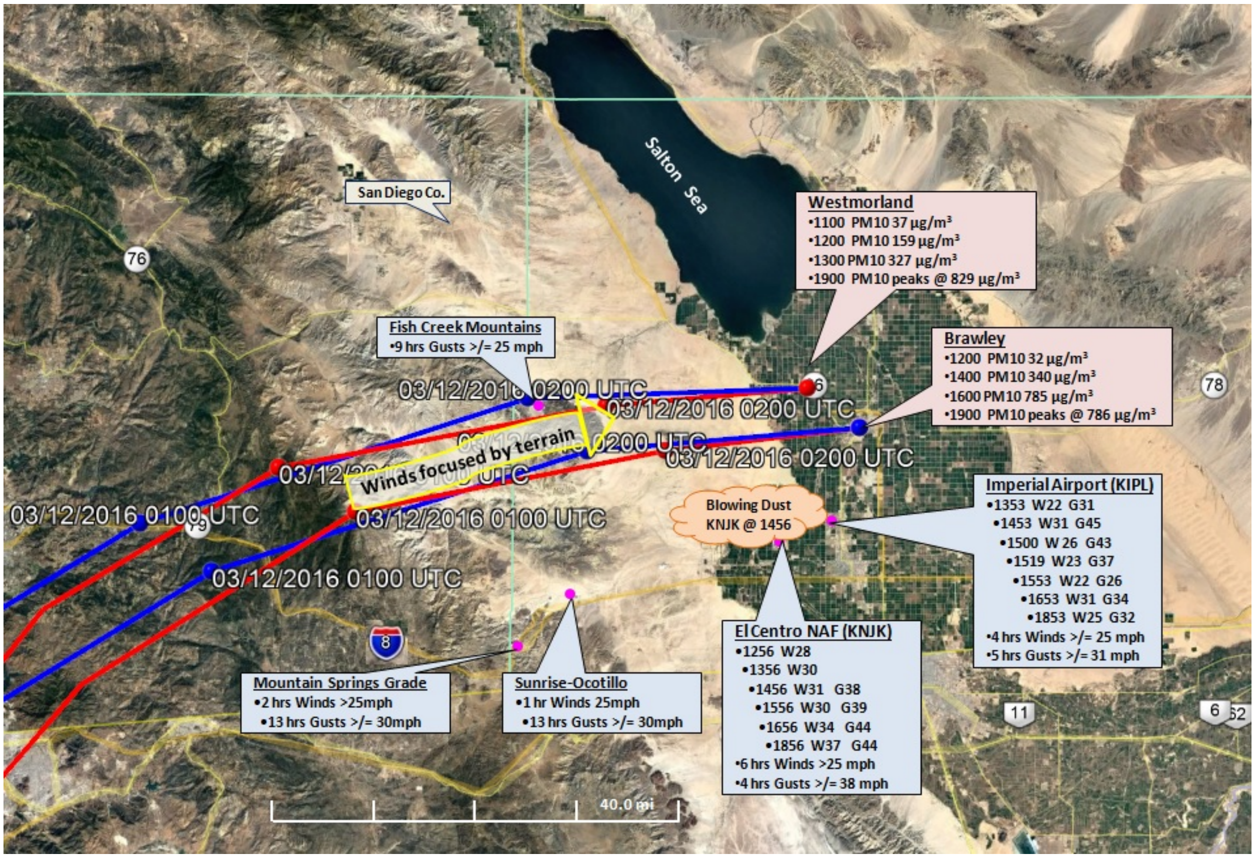


Fig 5-4: Gusty high winds transported windblown dust into Imperial County. The 12-hour HYSPLIT back-trajectory depicts the general airflow ending at the Brawley and Westmorland monitors at 1400 PST. Red trajectories indicate airflow at 10m; blue is airflow at 100m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 5-5 through 5-7 depict elevated levels of PM_{10} concentrations, elevated wind speeds and gust at the Brawley and Westmorland monitors, March 10, 2016 through March 12, 2016. A positive correlation between elevated wind speeds and concentrations is evident particularly with measured gusts, at the Imperial County Airport (KIPL) and the El Centro NAF (KNJKL).

Figure 5-7 depicts the relationship between the Westmorland and Brawley concentrations and upstream wind speeds over a 72-hour period. An increase in winds, particularly with gusts at upstream sites allowed for an increase in PM_{10} concentrations. Although winds remained high on March 12, 2016, the cold front as it moved over Imperial County brought with it scattered showers along with the strong westerly winds preventing the suspension and deposition of PM_{10}

onto the air monitors.[14] Precipitation reports released by the San Diego NWS office indicated slight precipitation levels within the San Diego County Mountains, such as in Borrego Dry Canyon (KCABORRE12) and elevated humidity through March 12, 2016. Other areas such as Shelter Valley (KCAJULIA25) and Lake Morena Village reported precipitation and elevated humidity through March 12, 2016. The precipitation and to some degree the elevated humidity levels would have allowed for the reduction of transported windblown dust from the San Diego Mountains into Imperial County.

FIGURE 5-5
BRAWLEY PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

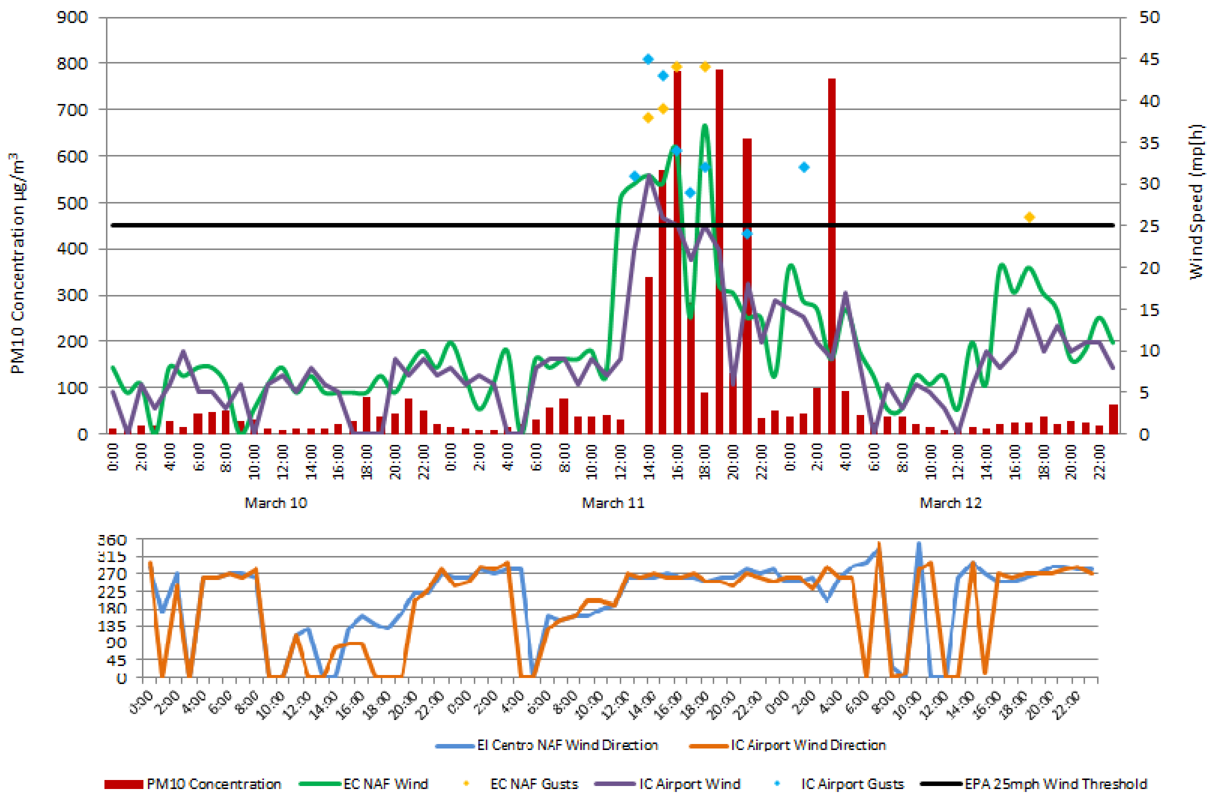


Fig 5-5: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds, and particularly with gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). Wind speeds increased as the wind shifted more westerly around mid-morning. The Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

[14] Area Forecast Discussion National Weather Service San Diego CA 1007 PM PST Friday, March 11, 2016

FIGURE 5-6
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

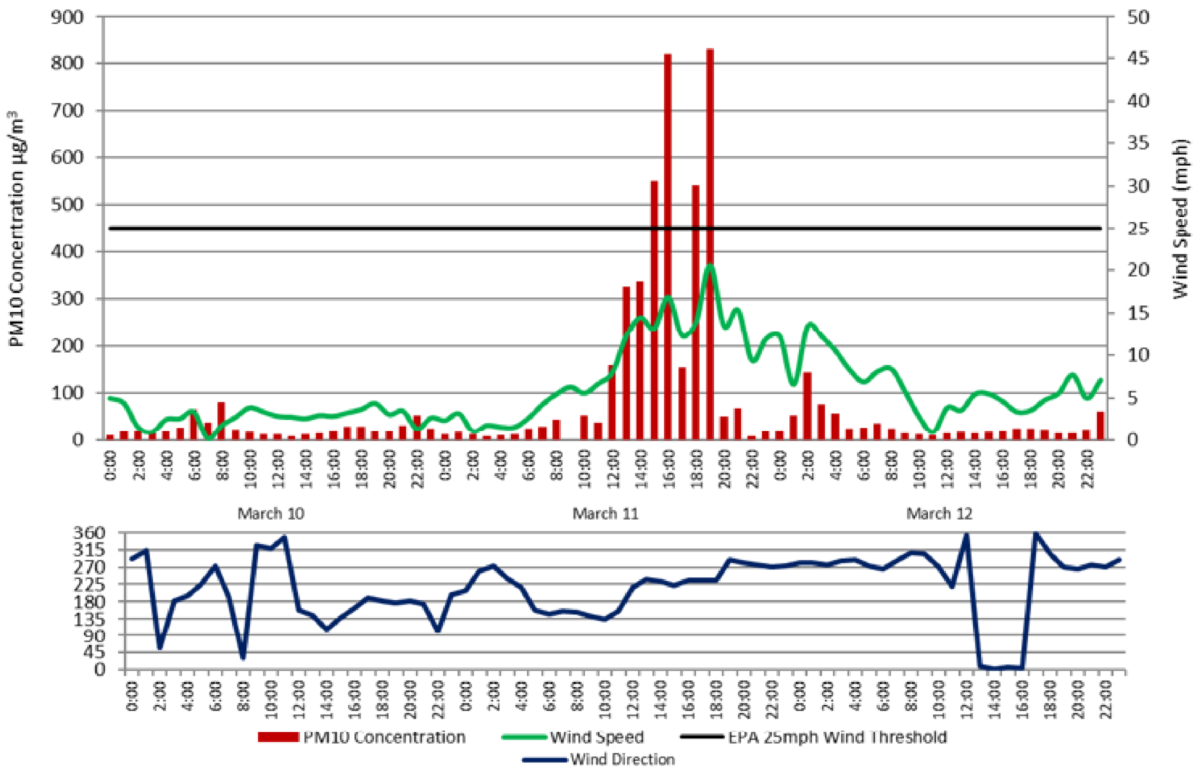


Fig 5-6: Winds at Westmorland measured lower than at Niland and the El Centro NAF and Imperial County Airport. The Westmorland station does not measure gusts an important element for the deposition of dust on the monitor. Gust played an important role in the deposition of windblown dust upon the monitor causing the Westmorland monitor to measure a higher 24-hour average than either the Brawley or Niland monitors. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-7
WESTMORLAND AND BRAWLEY PM_{10} CONCENTRATIONS UPSTREAM SITES

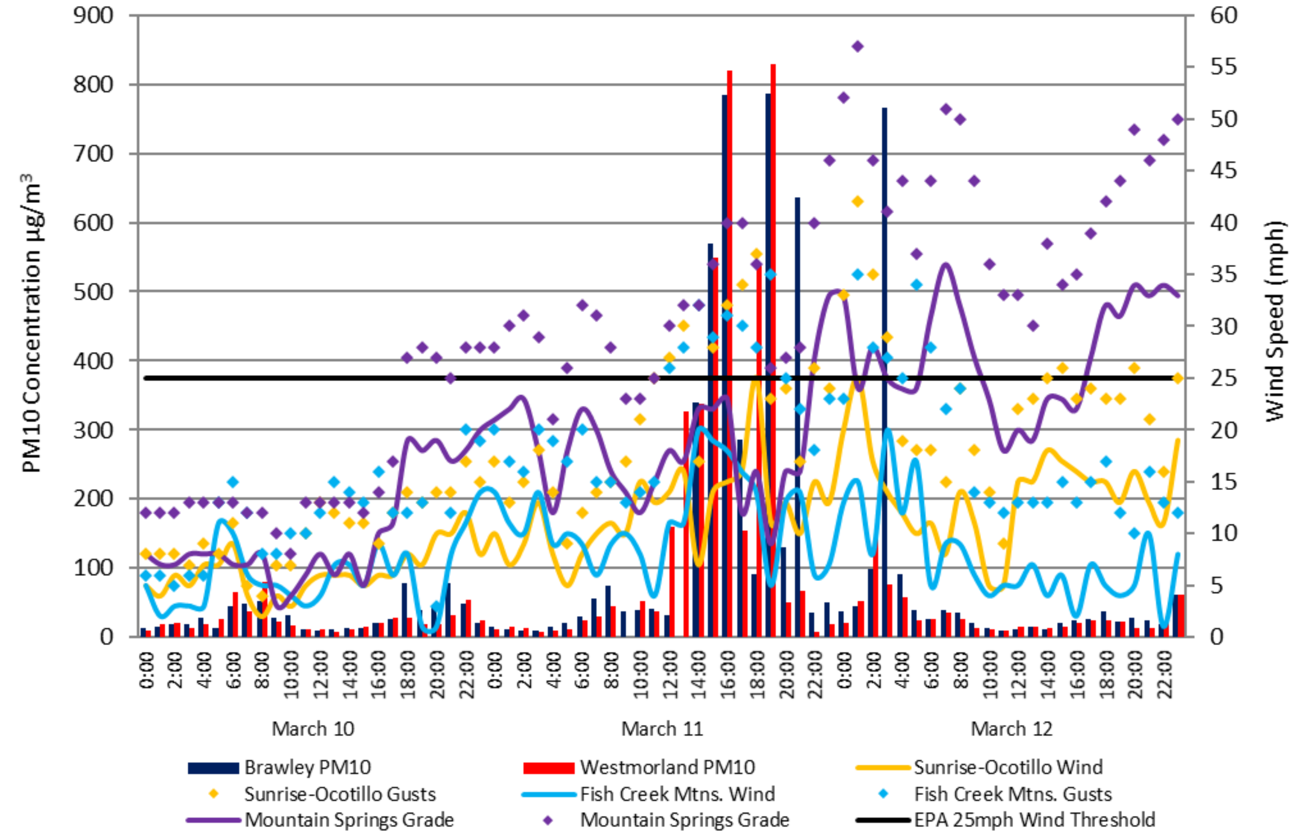


Fig 5-7: An increase in winds and particularly gusts at upstream sites led to an increase in PM_{10} concentrations as the dust laden winds made their way downstream. Although winds remained high on March 12, 2016, increased humidity and precipitation in the San Diego county mountains to the west of Imperial County acted to retard fugitive dust levels. Air quality data from the EPA's AQS data bank. Wind data from the University of Utah's MesoWest

Figure 5-8 compares the hourly concentrations measured at the Brawley, Westmorland, and Niland monitors March 10, 2016 through March 12, 2016. Although all three monitors measured elevated concentrations of PM_{10} only the Brawley and Westmorland monitors measured an exceedance. The Niland monitor measured 23 out of 24 hours of PM_{10} concentrations. It is unclear if the Niland monitor would have exceeded the NAAQS had the monitor measured a complete 24 hours. As mentioned above, precipitation levels played a role in the level of measured concentrations at the monitors. The soils located within the San Diego County Mountains although susceptible during the afternoon to mid-evening hours to suspension and transport by the evening hours sufficient moisture settled allowing for less suspension of particulates. Finally, the Niland monitor is located farthest east and well away from the western portion of Imperial County.

FIGURE 5-8
BRAWLEY, WESTMORLAND AND NILAND 72 HOUR PM_{10} CONCENTRATIONS

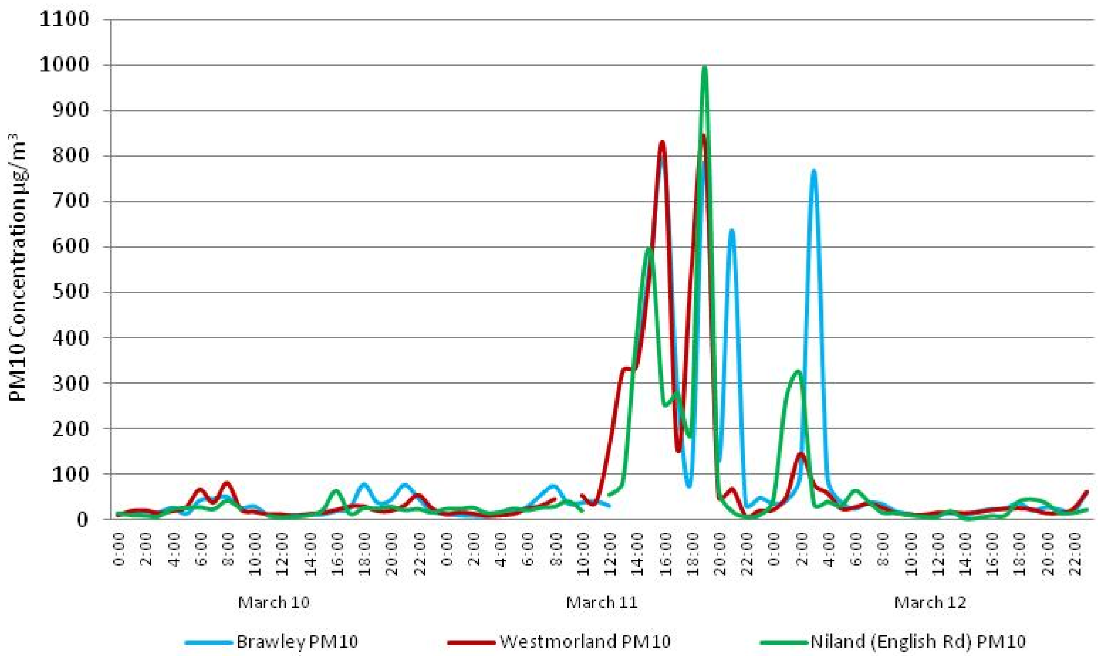


Fig 5-8: Although Niland measured elevated concentrations on March 11, 2016 it is unclear if the monitor would have exceeded the NAAQS had a single hour not failed to measure, power failure one hour

Figure 5-9 compares the concentrations at Calexico, El Centro, Brawley, Westmorland, and Niland between March 10, 2016 and March 12, 2016. Visibility[15] at Imperial County Airport (KIPL) and El Centro NAF (KNJK) reduced significantly just prior to elevated measured concentrations at the air monitors. This supports the assumption that the suspended particulate matter suspended by gusty westerly winds as measured by upstream sites blew downwind and affected air quality in Imperial County.

[15] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm

FIGURE 5-9
72 HOUR PM_{10} CONCENTRATIONS AND VISIBILITY

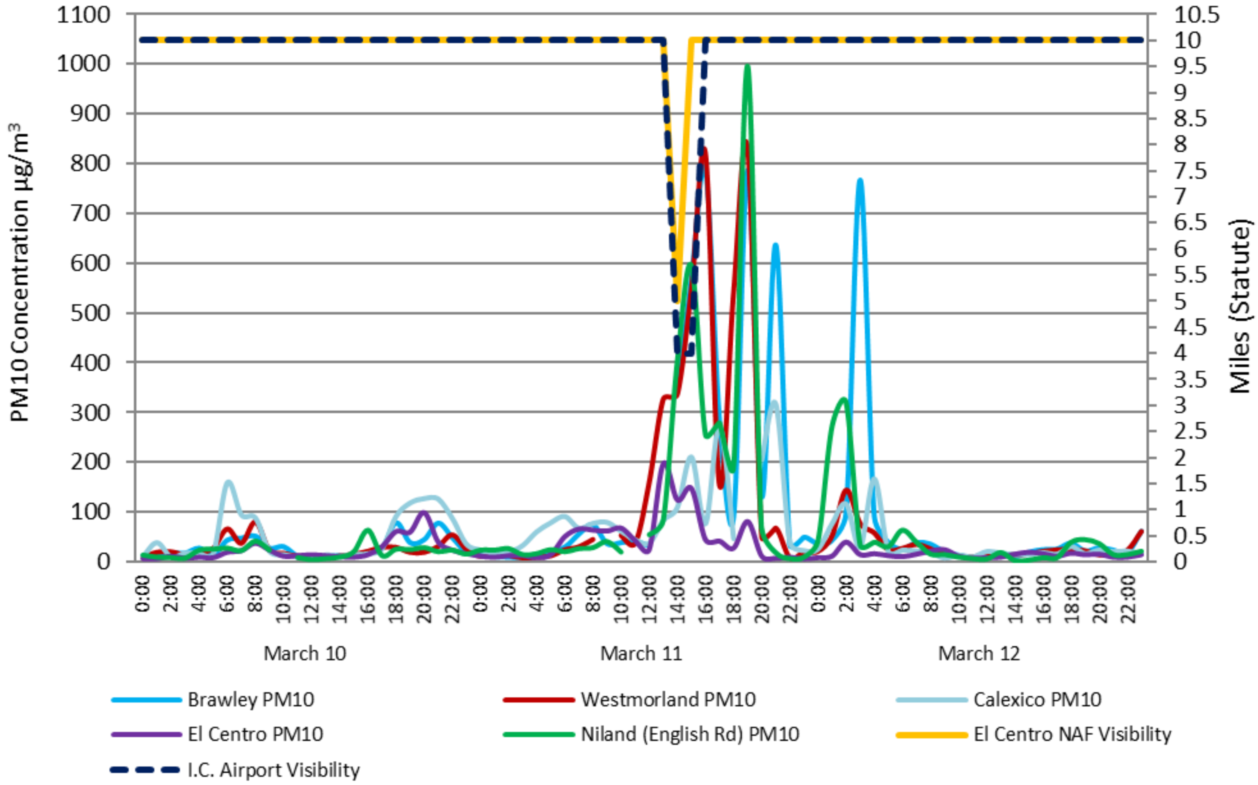


Fig 5-9: Visibility as reported from El Centro NAF (KNJK) and Imperial County Airport (KIPL) shows that visibility reduced significantly at KIPL prior to measured hourly peak concentrations at Brawley, Westmorland, and Niland. Visibility data from the NCEI's QCLCD data bank

As mentioned above, the earliest Urgent Weather Message, issued by the NWS office in Phoenix advised Imperial County residents that a Wind Advisory was in effect from 1400 PST to 2200 PST March 11, 2016. Subsequently, eight (8) additional Urgent Weather Messages, issued by the NWS office in San Diego or in Phoenix similarly advised of high gusty westerly winds within the San Diego Mountains and Imperial County. In addition, the NWS released Special Weather Statements and a Public Information Statement advising of strong gusty westerly winds. A useful tool when identifying the effect upon air quality by an event is the Air Quality Index (AQI)[16].

Figures 5-10 and 5-11 show the AQI for Brawley and Westmorland and help explain the level of effect upon air quality by the event on March 11, 2016. When the AQI levels change from Good

[16] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health affects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi

or "Green" to Moderate or "Yellow then to Unhealthy for Sensitive Receptors or "Orange", as it did in Brawley and Westmorland on March 11, 2016, one can reasonably discern the level of degradation of air quality in Imperial County on March 11, 2016.

FIGURE 5-10
AIR QUALITY INDEX FOR BRAWLEY MARCH 11, 2016

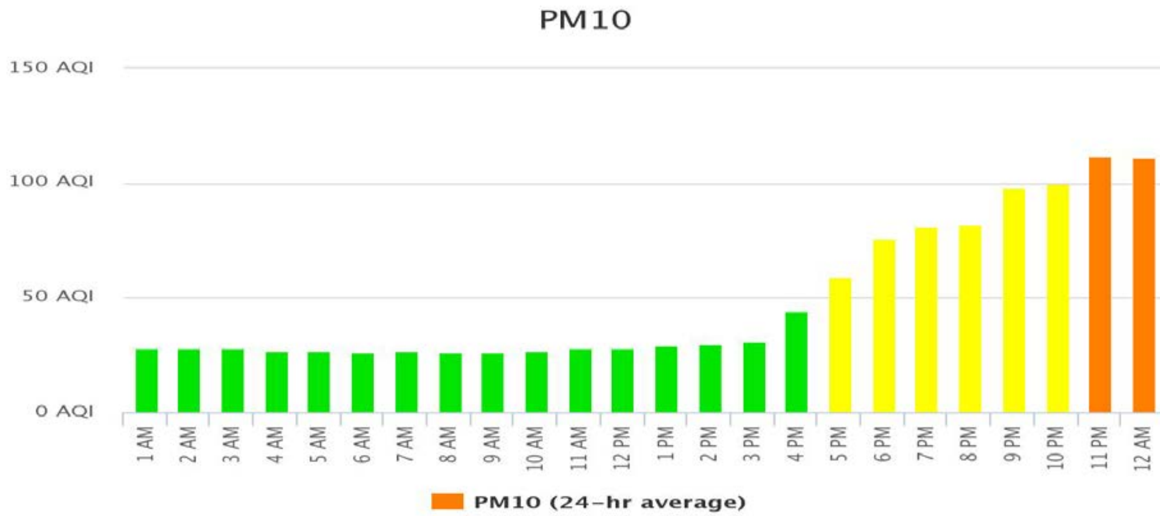


Fig 5-10: Demonstrates that air quality in Imperial County reduced or degraded as high gusty westerly winds associated with the passing of a Pacific cold front through California on March 11, 2016. Source: ICAPCD archives

FIGURE 5-11
AIR QUALITY INDEX FOR WESTMORLAND MARCH 11, 2016

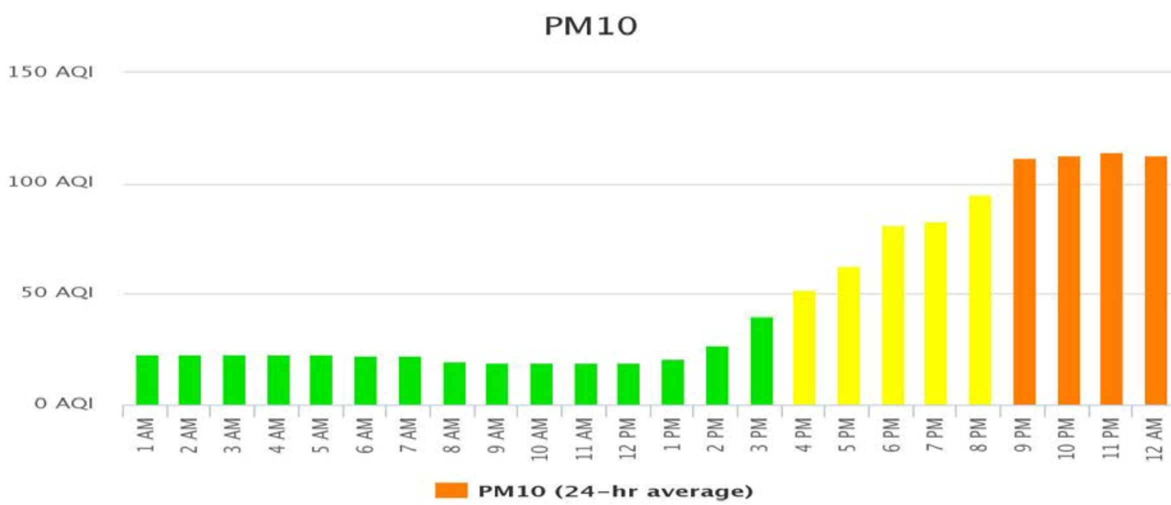


Fig 5-11: Demonstrates that air quality in Imperial County reduced or degraded as high gusty westerly winds associated with the passing of a Pacific cold front through California on March 11, 2016. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures and tables provide wind direction, wind speed and PM_{10} concentration data illustrating the spatial and temporal effects of the gusty west winds that were associated with the passage a powerful Pacific cold front that passed through the region. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley and Westmorland monitors on March 11, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} were carried aloft by strong westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on March 11, 2016 coincided with gusty high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-12
MARCH 11, 2016 WIND EVENT TAKEAWAY POINTS

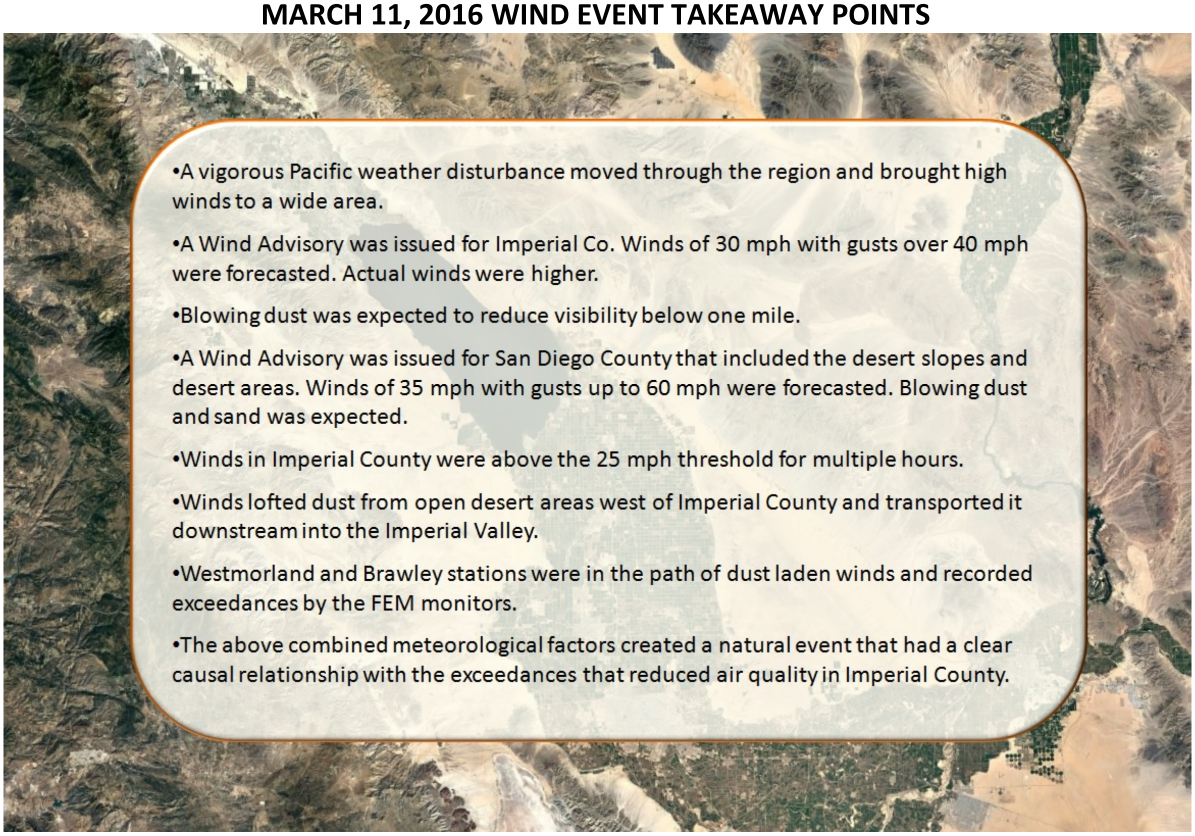


Fig 5-12: Illustrates the factors that qualify the March 11, 2016 natural event which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on March 11, 2016, satisfies the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	5-28
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	44-56; 57
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	29-35; 58
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	36-43; 57
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	44-56; 58

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the March 11, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be "not reasonably controllable or preventable" (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, strong gusty west winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley and Westmorland monitors caused by naturally occurring strong gusty westerly winds transported windblown dust into Imperial County and other parts of southern California from areas located within the San Diego Mountains. These facts provide strong evidence that the PM_{10} exceedance at the Brawley and Westmorland monitors on March 11, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event which may recur at the same location, with its resulting emissions where human activity played little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at the Brawley and Westmorland monitors on March 11, 2016, were caused by the transport of fugitive windblown dust into Imperial County by strong gusty westerly winds associated with the passage of low-pressure system and accompanying trough that moved through the region. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley and Westmorland during different days, and the comparative analysis of different monitors in Imperial and Riverside counties demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} on March 11, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the windblown fugitive emissions to the exceedances on March 11, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around March 11, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County. A **Supplemental Appendix A** contains copies of NWS notices pertinent to the March 6, 2016 event.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. Seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.